Basis of Design Report

Lower River and Inner Harbor of the Sheboygan River AOC

Sheboygan, WI

Prefinal Remedial Design

WA No. 150-RDRD-1507 / Contract No. EP-S5-06-01

Prepared for

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CH2MHILL®

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Acronyms and Abbreviations

AOC	Area of Concern
ASTM	American Society for Testing and Materials
BMP	best management practice
BODR	Basis of Design Report
BUI	Beneficial Use Impairment
CFR	*Code of Federal Regulations*
CWA	Clean Water Act
yd^3	cubic yards
ft^3/s	cubic feet per second
ESA	Endangered Species Act
FS	feasibility study
GAC	granular-activated carbon
GLLA	Great Lakes Legacy Act
GLNPO	Great Lakes National Program Office
GLNPOCS	Great Lakes National Program Cleanup Services
GLRI	Great Lakes Restoration Initiative
gpm	gallons per minute
GPS	geographic positioning system
HDPE	high-density polyethylene
LWD	low water datum
mg/kg	milligrams per kilogram
MGP	manufactured gas plant
µg/L	micrograms per liter
MVS	Mining Visualization Services
NAVD88	North American Vertical Datum of 1988
NHPA	National Historic Preservation Office
NRT	Natural Resources Technology, Inc.
NTU	nephelometric turbidity unit
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PRS	Pollution Risk Services
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
SHPO	State Historic Preservation Office
SWAC	surface-weighted average concentration
3D	three-dimensional
TSCA	Toxic Substances Control Act
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WDNR	Wisconsin Department of Natural Resources
WINSA	Wisconsin Naval Ship Association
WPDES	Wisconsin Pollutant Discharge Elimination System
WPSC	Wisconsin Public Service Corporation

SECTION 1

Introduction

This Basis of Design Report (BODR) for the Great Lakes Legacy Act (GLLA) sediment remediation project within the Lower River and Inner Harbor of the Sheboygan River Area of Concern (AOC) in Sheboygan, Wisconsin, has been prepared by CH2M HILL for the U.S. Environmental Protection Agency (USEPA) Great Lakes National Program Office (GLNPO), in consultation with the Wisconsin Department of Natural Resources (WDNR), City of Sheboygan, Sheboygan County, and GLNPO's construction contractor Ryba-Terra, under Contract No. EP-S5-06-01. The report includes elements specified in the Statement of Work dated April 26, 2011, and revised May 24, 2011, and the approved work plan dated June 30, 2011, for Work Assignment No. 150-RDRD-1507.

The purpose of the BODR is to establish the remedial design parameters for the remediation of contaminated sediment within a specific stretch of the Lower River and Inner Harbor of the Sheboygan River AOC. Specifically, the BODR covers the Lower River reach from 0.25 mile upstream of the 14th Street Bridge to the end of the Lower River reach at the Pennsylvania Avenue Bridge, and the Inner Harbor reach from the Pennsylvania Avenue Bridge to the 8th Street Bridge (Figure 1). Based on evaluations of the site conditions and potential alternatives and costs, GLNPO and WDNR, in consultation with the City of Sheboygan and Sheboygan County, selected a remedial alternative for sediment remediation of this river stretch consisting of mechanical dredging to remove sediment contaminated with polychlorinated biphenyls (PCBs) and polynuclear aromatic hydrocarbons (PAHs), placing a residual management cover over a portion of the river stretch, as needed, based on post-dredge sediment confirmation sampling results, processing and stabilizing of the dredged material, and disposing the processed dredge material offsite in permitted landfills.

A similar strategic navigational dredging project is being designed and will be implemented by the U.S. Army Corps of Engineers (USACE) immediately downstream of this project, from the 8th Street Bridge to the end of the Inner Harbor. A primary difference between the projects is USACE's project contains only low levels of PCBs that will be disposed of in an upland site. A third design and implementation project under GLNPO's authority is being led by WDNR and the City of Sheboygan, and consists of habitat restoration along the Sheboygan River AOC. This BODR is specific to the GLLA dredging project.

1.1 General Site Background

The Lower River and Inner Harbor segments of the Sheboygan River are located within the Sheboygan River AOC, in Sheboygan, Wisconsin. Historical waste discharge practices associated with the former Tecumseh Plant in Sheboygan Falls and the former Wisconsin Public Service Corporation (WPSC) Campmarina Manufactured Gas Plant (MGP) Site in Sheboygan have resulted in sediment contaminated with PCBs (Tecumseh) and PAHs (WPSC) in the Sheboygan River. Sediment characterization and remediation associated with the Sheboygan River Superfund Site has been progressing in phases, as performed by Pollution Risk Services (PRS) through a liability transfer agreement with Tecumseh, since 2003. PRS is expected to remove approximately 50,000 cubic yards (yd^3) of PCB-contaminated sediment from the Lower River and Inner Harbor by mid-2012. Integrys, the parent company of WPSC, removed approximately 28,500 yd^3 of sediment and shoreline contaminated with PAHs and nonaqueous phase liquid from the Campmarina MGP Site in 2011.

The Superfund program projects focus on addressing human and ecological risk threats. As a result, PCB- and PAH-contaminated sediment will remain in the Sheboygan River following removal of material required by the Superfund authority. The remaining sediment contamination also contributes to several beneficial use impairments (BUIs) in the Sheboygan River AOC, including restrictions on fish and wildlife consumption, degradation of benthos, and restrictions on dredging activities. Under the auspices of the Great Lakes Restoration Initiative (GLRI), GLNPO's goal is to take action that leads to delisting BUIs and eventually delisting the AOC. The program includes the involvement of several local, state, and other stakeholders. Table 1 provides a summary of project stakeholders.

TABLE 1
Project Stakeholders
Lower River and Inner Harbor of the Sheboygan River AOC Basis of Design Report

Entity	Role/Responsibility
Federal	
USEPA GLNPO	Lead federal agency, administrator of GLRI
USACE	Regulates dredging and fill activities; authorized to conduct routine maintenance dredging in the Sheboygan River and Inner Harbor
State	
WDNR	Project partner/project participant, lead state regulatory agency
Local	
City of Sheboygan	Project partner/project participant, owner of Campmarina MGP Site and other properties adjacent to the Sheboygan River and Inner Harbor; developed land use and redevelopment plans for AOC area
Sheboygan County	Project partner/project participant
Non-federal sponsors	
WPSC (Integrys)	Conducting sediment removal at the Campmarina MGP Site; expenditure leveraged as non-federal share for GLLA project
PRS	Conducting Superfund sediment remedial action in Sheboygan River; expenditure leveraged as non-federal share for GLLA project

The GLNPO remedial action focuses on sediment remaining in-place following the PRS and Campmarina MGP Site actions. A remedial investigation (RI) conducted in 2010–2011 by CH2M HILL augmented existing characterization data collected by PRS and Natural Resources Technology (NRT) for WPSC, particularly the vertical extent of contamination. For more details on site background, history, or RI results, reference the final RI report (CH2M HILL 2011a).

1.2 Site Description

1.2.1 Local Demographics and Land Use

The City of Sheboygan is in Sheboygan County, in Eastern Wisconsin on the western shores of Lake Michigan. The city is approximately 14.5 square miles with a population of 50,400 (City of Sheboygan 2011). Land adjacent to the Lower River and Inner Harbor is recreational, commercial, and industrial with some residential areas. There are no public beaches along the river, but public and recreational boat access is available at a number of locations within the City of Sheboygan in the Lower River and Inner Harbor (USEPA 2010).

1.2.2 Climate

The following temperature and precipitation data were obtained from the Midwestern Regional Climate Center using the Sheboygan County Weather Station, COOP ID: 477725[1]. The averages cited are based on the period of record from 1971 to 2000. The average monthly temperature for Sheboygan, Wisconsin, ranges from 20.9 in January to 71.4 degrees Fahrenheit in July. The annual average temperature is 47.1 degrees Fahrenheit. The Sheboygan area receives an average of 31.9 inches of precipitation every year, ranging from an average of 1.33 inches of precipitation

[1] http://mcc.sws.uiuc.edu/climate_midwest/mwclimate_data_summaries.htm

in February to 4.08 inches in August. The annual average snowfall is 48.3 inches, with the maximum snowfall generally occurring in January (14.8 inches).

1.2.3 Topography

The elevation of the Sheboygan River basin is variable, ranging from 50 to 150 feet in elevation above lake level. The topography within the basin is also variable, ranging from a low, flat moraine in the east to a kettle moraine in the central area. The western area of the Sheboygan River watershed contains numerous wetlands located in pockets between low rounded hills. The basin generally slopes to the east with gradients ranging from 0 to 21 feet per mile. The average gradient is 7 feet per mile. The low water datum (LWD) for Lake Michigan at Sheboygan is 578 feet above mean sea level based on the North American Vertical Datum of 1988 (NAVD88).

1.2.4 Regional Geology

The investigation area lies on the Niagaran cuesta of the Lake Michigan basin and generally is underlain by unconsolidated glacial drift. The drift, in turn, is underlain by Niagaran limestone and/or dolomite. The glacial drift is comprised of unsorted till as ground and end moraine, outwash as sorted and stratified sand and gravel, and glacial lake deposits as organic materials and stratified clays, silt, and sand. Low permeable soils are indicative of the high clayey tills and lake bed deposits that blanket the majority of Sheboygan County. Moderate and high permeable soils are typically associated with the less clayey till, outwash, and end moraine (NRT 2009). Surface and near-surface sediment in the Sheboygan River are predominantly fine-grained silt and sand with some organic material. Sediment thickness and physical characteristics of the sediment are discussed in Section 4.

1.2.5 Hydrology—Sheboygan River

The Sheboygan River watershed covers approximately 260 square miles with its headwaters located in Fond du Lac County. Near Lake Michigan, the Sheboygan River is a gaining stream that receives groundwater and surface water from the Sheboygan area and discharges into Lake Michigan.

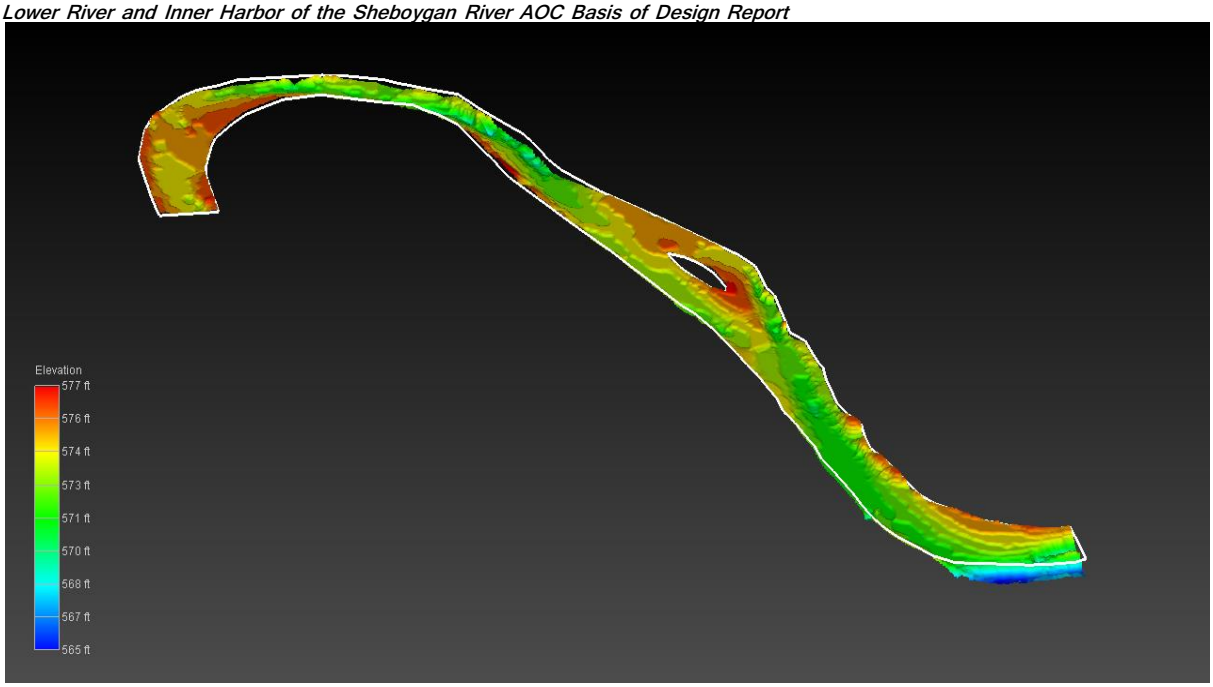
The river bed elevation within the limits of the project area ranges from approximately 564.37 to 575.85 feet NAVD88 based on the survey data collected during the RI (CH2M HILL 2011a). Water depths ranged from 1.20 to 12.8 feet below the LWD at the time of sampling. The water depth of 1.2 feet below LWD was near the southern tip of Boat Island, and the water depth of 12.8 feet below LWD was near the southern bank of the river as the river bends upstream of the 8th Street Bridge. See Exhibit 1 for a visual representation of the depth of water in the project area relative to the LWD of 578 feet NAVD88, based on 2009 bathymetry conducted by PRS. Appendix A contains depth of water maps and profiles of sediment elevation related to top of water from 2009 bathymetry conducted by PRS (area upstream of 14th Street Bridge only; excerpted from 100 percent design [PRS 2010]).

The general direction of flow in the Sheboygan River is easterly, toward the lake, with dams located upstream of the project area at Sheboygan Falls and Kohler. The U.S. Geological Survey has two automated stream gauging stations: one 3.9 miles upstream of the project area near Interstate Highway 43 (I-43) (currently operational[2]) and the other near the mouth of the Sheboygan River (no longer in operation).

Annually, the months with the highest average flows are March and April, when daily means have reached 995 cubic feet per second (ft^3/s). The historical monthly mean flows for March and April are 685 and 711 ft^3/s, respectively. The 2-year storm discharge was calculated to be 3,140 ft^3/s, and the 100-year storm discharge was reported to be 9,480 ft^3/s (Walker and Krug 2003). Historical records from the stream gauge at I-43 indicate the maximum peak flow event of 7,820 ft^3/s occurred on August 6, 1998 (U.S. Geological Survey 2011).

[2] http://waterdata.usgs.gov/wi/nwis/dv/?site_no=04086000&agency_cd=USGS&referred_module=sw

EXHIBIT 1
2009 Top of River Sediment Bathymetry
Lower River and Inner Harbor of the Sheboygan River AOC Basis of Design Report



Low Water Datum = 578 feet NAVD88
Depth to sediment ranges from 1.6 to 12 feet below LWD, before PRS and Campmarina MGP Site dredging

1.2.6 River and Channel Characteristics

The banks of the river within the GLLA project area are largely natural earthen banks on the upstream end and are dominated by constructed bulkheads and reinforced or armored shorelines as the river progresses downstream to the 8th Street Bridge. Figure 2 categorizes the shoreline banks as natural slope with either timber pilings; concrete blocks or riprap; or consisting of sheet pile. A photograph log of the shoreline features is included in Appendix E of the RI report (CH2M HILL 2011a).

The width of the river varies from 150 to 250 feet within the project reach. The average width within the project reach is approximately 200 feet.

1.2.7 Federal Navigational Channel

A federally authorized USACE navigation channel begins 400 feet downstream of the Pennsylvania Avenue Bridge progressing downstream throughout the remainder of the project area, and downstream to the harbor. The navigation channel is aligned with the river right descending (right side of river if facing downstream) and transitions in depth from 15 feet below LWD to 21 feet below LWD approximately 700 feet upstream of the 8th Avenue Bridge (Exhibit 2). Available records indicate the last time the federally authorized channel was dredged by USACE upstream of the 8th Street Bridge was in 1956 (Exhibit 3).

EXHIBIT 2

Federal Navigational Channel Transitions to 15 feet from 21 feet below LWD Upstream of the 8th Street Bridge

Lower River and Inner Harbor of the Sheboygan River AOC Basis of Design Report

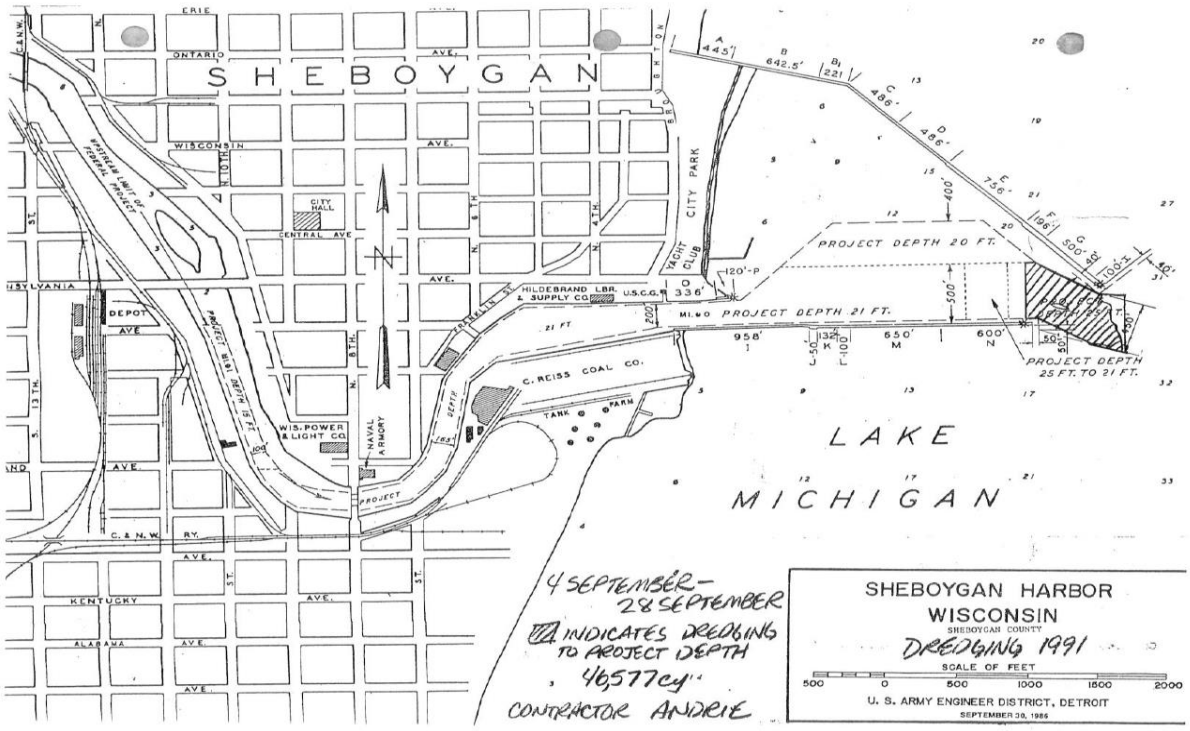
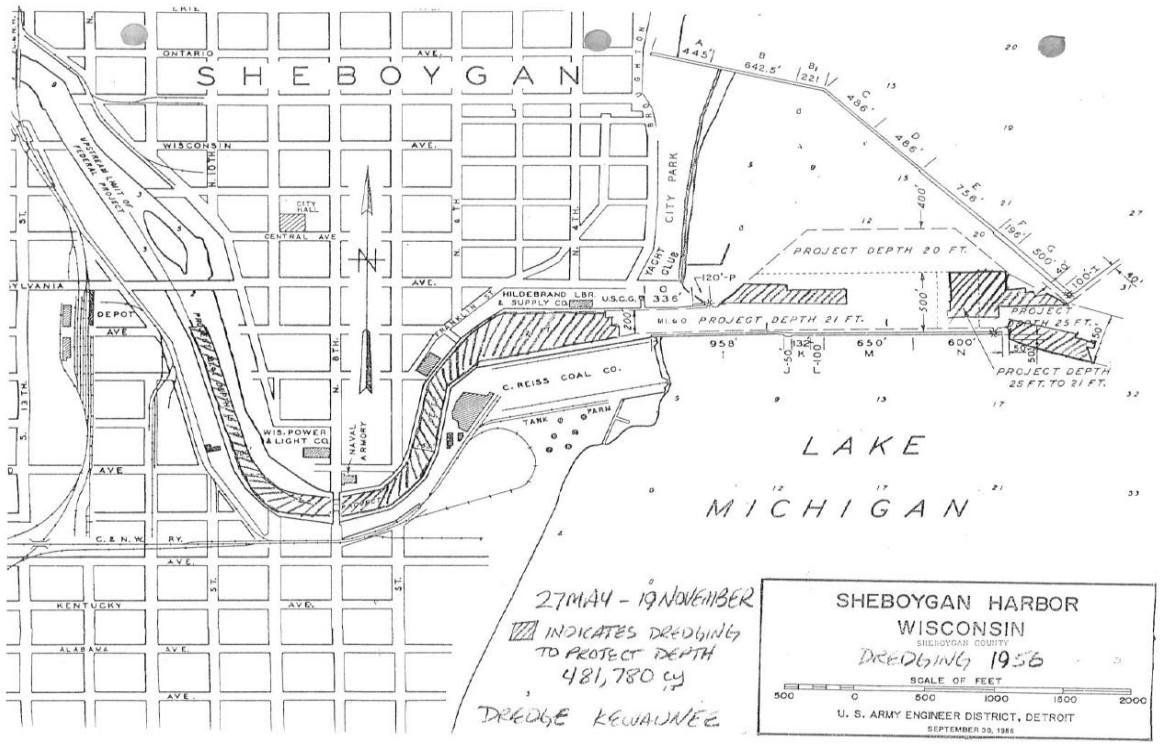


EXHIBIT 3

Historical Dredging in Federal Navigational Channel Conducted by USACE in 1956

Lower River and Inner Harbor of the Sheboygan River AOC Basis of Design Report



1.3 Remedial Action Objectives

Remedial action objectives (RAOs) are requirements that remedial alternatives should achieve to provide adequate protection of human health and the environment, make improvements to the AOC such that BUIs can be lifted, while also meeting requirements or complying with permits.

General remedial objectives relate to specific contaminated media such as sediment, potential exposure routes, and identification of target cleanup goals and the removal levels necessary to meet the cleanup goals. The analysis is focused on the contaminated sediment at the Sheboygan River Site. Remediation of contaminated sediment within the area is expected to result in a long-term reduction in PCB and PAH mass transport in the Sheboygan River as well as improving the beneficial use impairments.

The following RAOs were established for the assessment of remedial alternatives:

- Support removal of BUIs within the Sheboygan River AOC
  - Fish and wildlife consumption advisories
  - Degradation of benthos
  - Restrictions on dredging
  - Degradation of fish and wildlife habitat
- Minimize potential human health and environmental risks associated with remedial activities, to the extent practical
- Upon completion of remedial activities, improve habitat of the site through restoration efforts (this is a separate project under the direction of WDNR and will not be discussed further in this report)

1.4 Description of Remedial Action

The selected remedy is sediment removal with a possible residual management cover depending on post-dredging concentrations where remaining sediment exceed target concentrations. A description of the components of the remedial action is discussed in the following subsections.

1.4.1 Sediment Removal Process

Sediment will be mechanically dredged by an environmental clamshell bucket and transported to a sediment processing area by barges. It is anticipated that the project will be conducted as three distinct areas of operation (Figure 1):

- Area 1—The area upstream of the 14th Street Bridge
- Area 2—The area downstream of the 14th Street Bridge and upstream of the Pennsylvania Avenue Bridge
- Area 3—The area downstream of the Pennsylvania Avenue Bridge and upstream of the 8th Street Bridge

The mechanical dredge method will use an environmental clamshell bucket, with a smooth cut surface and no teeth to dredge the sediment to the specified dredge depths. If needed, in areas of high sand content and debris, a conventional clamshell bucket with teeth or a closed excavator bucket will be used. The clamshell bucket can either be operated by a crane or cable positioned on the barge. The bucket is controlled by the operator using geographic positioning system (GPS) equipment with integrated software that allows the bucket's position to be monitored in real time. The dredged sediment is then loaded into the watertight scow barges and transported to the offloading site, where it is offloaded for dewatering and disposal. The Toxic Substances Control Act (TSCA) sediment will be collected and transported separately from the non-TSCA sediment, to meet the applicable 40 *Code of Federal Regulations* (CFR) 761 requirements. The excess water retained in the scow barges is directly pumped off to the temporary onsite water treatment system.

Sediment from Areas 1 and 2 will be transported to the Campmarina MGP site for offloading and processing. Sediment from Area 3 is planned to be transported to the Wisconsin Naval Ship Association (WINSA) Site (Figure 1) for offloading and processing.

1.4.2 Processing of Sediment

Sediment must be dewatered to meet transportation and disposal facility requirements. In general, free water on top of the sediment will be pumped directly from the watertight scow barges to the temporary onsite water treatment system. After free water is pumped out, a reagent will be mixed in to dry sediment to further dry the sediments. For this design, it is assumed the reagent will be mixed into the sediment on the sediment processing area; however, the GLNPO Cleanup Services (GLNCPOCS) contractor may propose alternate means and methods such as mixing the reagent in the barges or in a pugmill prior to sediment placement in the sediment processing area. Pilot treatability tests will be conducted by the GLNCPOCS contractor to choose the reagent and ratio needed. The blended sediment-reagent mixture will be offloaded onto the sediment processing area for storage and further drying until the sediment contains no free liquids, and meets the requirements for transportation (for example, passing the paint filter test) by a licensed hauler and the licensed disposal facility. Water that seeps from the sediment piles as they are drying will be collected in a sump and directed to the temporary water treatment system. Stabilized sediment will be directly loaded into the trucks equipped with watertight beds and will be covered with a retractable tarp. The exterior of the truck will be washed with a pressure washer to remove visible sediment and soil, which will be directed to the water treatment system. When truck washing is complete and the waste manifest and other required paperwork is completed, the truck will depart the site and transport the sediment to an approved and appropriately permitted offsite landfill.

Sediment will be processed in the sediment processing area according to the concentration of PCB to meet the applicable 40 CFR 761 requirements. Sediment with more than 50 milligrams per kilogram (mg/kg) of PCBs exceeds the TSCA threshold and will be processed in the TSCA area of the sediment processing area. Sediment with less than 50 mg/kg of PCBs is non-TSCA sediment will make up the majority of the sediment removed from the river for this project, and will be processed in the larger non-TSCA portion of the sediment processing area.

1.4.3 Water Treatment and Discharge

Water generated during the sediment processing activities will be treated onsite by a temporary water treatment system so it can be discharged to the river. The water will be treated to remove the contaminants of concern and suspended solids to meet the water quality discharge requirements set by a Wisconsin Pollutant Discharge Elimination System (WPDES) permit. When the effluent water meets the discharge criteria, it will be discharged to the Sheboygan River. The solids generated during the treatment process will be characterized and disposed offsite as either TSCA or non-TSCA material along with the solidified dredge material removed from the river.

Water treatment systems may be constructed for each of the two sediment processing area areas. Separate WPDES permits will be required for each discharge point; hence, two permits are anticipated: one for the Campmarina MGP Site sediment processing area and one for the WINSA Site sediment processing area. Monitoring of the discharge and associated reporting will be performed for compliance with the permits. Stormwater generated outside the sediment processing area will be managed separately under the stormwater management permit.

1.4.4 Offsite Disposal

Stabilized sediment will be transported by truck to permitted offsite disposal facilities. A combination of offsite disposal options will be used. The dredge material will be profiled for waste classification and landfill acceptances will be obtained by the GLNPOCS contractor. Multiple disposal facilities may be used to process the volume of dewatered sediment anticipated depending on capacity and operational considerations.

1.4.4.1 Sheboygan County Airport

In support of the navigational dredging project to be implemented by the USACE, an estimated 7,000 yd^3 of sediment with a PCB concentration of less than 1 mg/kg will be transported by the GLNPOCS contractor to the Sheboygan County Airport and placed in USACE's disposal facility.

1.4.4.2 Subtitle D Landfill

The majority of the sediment to be removed will contain less than 50 mg/kg PCBs and will qualify as non-TSCA sediment that can be disposed of in a Subtitle D solid waste landfill with necessary permits. PAH sediment, as well as

other PAH-contaminated material, and debris not suitable for recycling will also be disposed of in a Subtitle D solid waste landfill.

1.4.4.3 TSCA Landfill

Specially approved facilities are needed for disposal of materials exceeding the TSCA criteria (PCB concentrations greater than 50 mg/kg). Sampling and analysis performed to date indicate the presence of TSCA material within the project area with in situ concentrations equal to or greater than 50 mg/kg PCBs. The sediment requires disposal at a chemical landfill operating in accordance with 40 CFR 761.75 to accept materials that exceed TSCA criteria and will also need to be permitted to accept anticipated levels of PAH waste. Dredge material exceeding the TSCA criteria will be transported to and disposed of at out-of-state landfills because no TSCA landfills exist in Wisconsin. Appropriately permitted landfills with available capacity are located in Michigan, Indiana, and Oklahoma.

SECTION 2

Basis of Design

Section 2 summarizes the technical parameters upon which the prefinal and final designs will be based.

2.1 Sediment Characterization

The findings of the field investigation relative to the nature and extent of contamination in the project area are summarized in the following subsections and described in detail in the *Final Remedial Investigation Report, Lower River and Inner Harbor of the Sheboygan River* (CH2M HILL 2011a).

2.1.1 Sediment Stratigraphy and Physical Characteristics

Based on a review of the sediment core boring logs, two distinct stratigraphic units are present in the study area. The core logs indicate that soft sediment consisting of largely interbedded layers of silt, sand, and silt layers containing sand lenses are underlain by a native unit of dense, firm clay or silty clay, which was labeled as native material in the boring logs and summary tables.

Within the project area, the measured sediment thickness ranged from less than 1 foot to 13 feet thick. Sediment located on the upstream of Boat Island is thinner, with the thicker deposits located in the historical navigational channel between Pennsylvania Avenue and 8th Street. The sediment consists of layers of clayey silt to sandy silt. Upstream of Boat Island, the sediment is predominantly sand, silty sand, and gravel underlain by dense, firm clay or silty clay. Water depths within the project area limit ranges from 2 to 13 feet. The top of sediment surface elevation ranges from elevation 576 to 565 feet NAVD88, and the top of clay elevation from 558 to 572 feet NAVD88.

Grain size results indicate sediment is primarily silt/clay and sandy silt. The mean value of percent fines was 42 percent within the project area. Table 2 presents the summary of the average grain size results of the samples collected within the project area.

TABLE 2

Summary of Average Grain Size Results

Lower River and Inner Harbor of the Sheboygan River AOC Basis of Design Report

Location	% Coarse Sand and Gravel (<10 Sieve)	% Fine and Medium Sand (10<Size>200 Sieve)	% Fines (> 200 Sieve)
Sheboygan River Project Area	9.7	48.3	42

Total organic carbon results of samples collected in the project area ranged from 0.06 to 6.35 percent, with a mean value of 1.7 percent. Grain size and total organic carbon sample locations and results are presented in Tables D-1 and D-2 within Appendix D of the RI report (CH2M HILL 2011a).

2.1.2 Data Evaluation Summary

The RI data were evaluated by using a computer-based three-dimensional (3D) interpolation method to delineate the horizontal and vertical extent of sediment containing various PCB concentrations and PAH. The computer application Mining Visualization System (MVS) v9.22 by CTECH was used to interpolate the PCB and PAH concentrations. The PCB and PAH concentration distribution was modeled within a 3D mesh using a geostatistical process called kriging. The models use expert systems to analyze the spatial distribution and number of field data points; construct a multidimensional variogram, which is a best fit to the dataset being analyzed; and then perform kriging in the domain of the model. One of the fundamental design criteria used in developing the variogram and kriging algorithms was to produce modeled distributions that honor the measured distributions as closely as possible.

2.1.2.1 Chemical Data Set

The chemical data set for the project area upstream of the 8th Street Bridge (including Areas 1, 2, and 3) has been collected over a period of 3 years by PRS, NRT, and CH2M HILL as described in the RI report (CH2M HILL 2011a).

The analytical results for the RI conducted by CH2M HILL show significant PCB and PAH contamination throughout the sediment profile, primarily within the authorized navigational channel upstream of the 8th Street Bridge in Area 3 and between the navigational channel and the Campmarina MGP Site in Area 2 and Area 3. The upstream limit of the navigational channel begins about 400 feet downstream of the Pennsylvania Avenue Bridge. The 100-foot-wide authorized channel depth is 15 feet below LWD at elevation 563 feet NAVD88 for approximately 1,500 feet downstream, where it transitions to an authorized depth of 21 feet below LWD to an elevation of 557 feet NAVD88 and begins to widen. The navigational channel upstream of the 8th Street Bridge and the full channel downstream of the 8th Street Bridge were last dredged by USACE in 1956. A review of the chemical data suggests the navigational channel upstream of the 8th Street Bridge acted as a natural sediment trap or sink over the last 55 years. Note the period of ongoing discharge of PCBs from Tecumseh is thought to have occurred between 1966 and 1971. Operations at the Campmarina MGP Site ended in 1929, with structures removed between 1950 and 1966.

Deposition and scour in the river bed appear to be present and appear to have modified concentrations and thickness of sediment in some of the areas within the project area. Around the 8th Street Bridge, the river bends and scouring occurs. The in-water bridge support structures also serve to narrow and funnel water flow, and may impact sediment profiles. Activity-induced scour may also occur by human activities, such as bridge construction and repair. Upstream of the 8th Street Bridge, large zones of sediment with concentrations of PCBs exceeding TSCA levels were found within the navigational channel. Sediment with PAHs exceeding 8,000 mg/kg with evidence of nonaqueous phase liquid was found adjacent to and downstream of the Campmarina MGP Site. An examination of the Campmarina MGP Site RI report (NRT 2009) portrays the downstream extent of Campmarina MGP Site's contamination to end where the navigational channel begins. A potential hypothesis is that the first and only dredging of the federal navigational channel in 1956 removed the existing PAH contamination that had migrated downstream from the Campmarina MGP Site and created a low area that captured continuing migration of PAH- and PCB-contaminated sediment from upstream, likely accelerated by flood events. Flood events greater than 6,000 ft^3/s between 1957 and 1997 occurred in 1960, 1975, 1978, 1979, and 1997. Based on bathymetry surveys, between 8 and 9 feet of soft sediment was deposited in the navigational channel between 1957 and 1997 (WDNR 2010). The deeper PCB and PAH contamination was not detected during previous investigations because the investigations focused on shallower sediment.

2.1.2.2 Survey and Volume Estimates

Survey data and volume estimates are summarized in the following subsections.

Survey Datum Information

Several surveying datums are associated with the project area and conversion between datums is needed. The design will use the following datums:

- Horizontal Datum: Wisconsin State Plane South North American Datum of 1983 U.S. Survey Feet
- Vertical Datum: NAVD88

The vertical datum is based on mean sea level and is also known as the National Geodetic Vertical Datum of 1929. National Geodetic Vertical Datum of 1929 elevations are 0.1 foot higher than elevations in NAVD88. However, the City of Sheboygan has its own vertical datum known as the Sheboygan City Datum. Areas along Lake Michigan occasionally also reference two other vertical datum: the International Great Lakes Datum of 1985 and the Lake Michigan LWD. The LWD for Lake Michigan is 0 feet LWD or elevation 577.5 feet International Great Lakes Datum of 1985, which is equivalent to elevation 578 feet NAVD88 at the project site in Sheboygan. Table 3 provides conversions between the various datums for this project site.

TABLE 3
Vertical Datum Conversions
Lower River and Inner Harbor of the Sheboygan River AOC Basis of Design Report

Sheboygan City Datum	Mean Sea Level Datum	National Geodetic Vertical Datum of 1929 (NGVD29)	North American Vertical Datum of 1988 (NAVD88)	International Great Lakes Datum of 1985 (IGLD85)	Lake Michigan Low Water Datum (LWD)
0.0 feet	581.0 feet	581.0 feet	580.9 feet	580.4 feet	2.9 feet

Source: NRT. 2011. *Feasibility Study—Sheboygan-Campmarina River OU.*

MVS Modeling

The physical and chemical site characterization data were evaluated and input into a 3D model. The 3D interpolation method was used to show the PCB and PAH distributions within the sediment and evaluate concentration data in relation to the proposed Superfund and Superfund Alternative remedial actions. The computer application MVS v9.22 by CTECH was used to present and interpolate PCB and PAH concentration data. The interpolated model data was used to assist in determining extent of removal for the remedial design. The data sets, procedures, and analyses associated with the MVS modeling effort are described in detail in the RI report (CH2M HILL 2011a).

MVS Results: Scenario 10

The MVS 3D model was used to produce estimated dredge removal quantities and extents within the project area (0.25 mile upstream of the 14th Street Bridge to the 8th Street Bridge as shown in Figure 3) using several analytical isosurfaces and geologic surfaces developed from the PCB and PAH model results, as well as bathymetric and sediment thickness data as part of the feasibility study (FS) (CH2M HILL 2011b). Specifically, isosurfaces were developed to represent the sediment surface after removal of sediment with concentrations greater than 1 mg/kg PCBs and 18 mg/kg PAHs above the elevation of 568 NAVD88 (-10 feet LWD). The isosurfaces also represent the sediment surface below elevation 568 NAVD88with concentrations greater than 5 mg/kg PCBs to any elevation and removal of sediment with concentrations of PAHS greater than 18 mg/kg from 500 feet upstream and 1,000 feet downstream of Boat Island to any elevation. Additionally, removal of sediment to create a 60-foot-wide channel to elevation 570 NAVD88 (-8 feet LWD) immediately between the Pennsylvania Bridge and the 14th Street Bridge was incorporated to facilitate boat and barge traffic. Model screen shots are contained in Appendix B.

Each respective analytical isosurface for PCBs and PAHs, as well as the 60-foot channel geologic surface was then used to estimate a respective extent and volume for each and then combined for a total extent and volume. Volumes associated with this project are separate from the Superfund remedial action and Campmarina MGP Site remediation currently occurring. Sediment containing between 1 and 50 mg/kg PCBs with overburden (clean material overlying the contaminated material that requires removal to get to the contaminated material) based on the models combined isosurfaces are estimated at 184,000 yd^3. Sediment containing greater than 50 mg/kg PCBs is estimated at 13,000 yd^3, for a total of 197,000 yd^3. The model volume estimate for Scenario 10 includes 10-foot offsets from shoreline, but does not consider dredging side slopes or overdredge tolerances.

The TSCA boundary depicted within the design drawings was derived from MVS using the PCB data set as described within Section 2.1.2.1 and is based on the 2009 bathymetry before any TSCA material was removed by PRS and the Campmarina MGP Site projects. Sample results from the data gap sediment sampling conducted in November 2011 (Appendix C) were used to update the MVS model and subsequently the TSCA boundary. Further evaluation of the available sample data collected as part of the Superfund and Campmarina MGP Site remedial actions were reviewed and used in conjunction with the MVS model update to redefine current TSCA extents.

EXHIBIT 4
Removal Criteria—MVS Model Scenario 10
Lower River and Inner Harbor of the Sheboygan River AOC Basis of Design Report

- **Above 568‘ (-10 LWD): >1 mg/kg PCBs, >18 mg/kg PAHs, and 60' Channel to 570’ (-8 LWD) upstream of Boat Island to 14th Street Bridge**
- **Below 568' (-10 LWD): >5 mg/kg PCBs to any elevation and >18 mg/kg PAHs to any elevation from 500 feet upstream and 1,000 feet downstream of Boat Island (Figure 3)**

2.1.2.3 Sediment Dredge Volume Estimate

The dredge surfaces selected using the MVS model were imported into a computer-aided design system for use in producing the final design drawings and estimating the volume of sediment that will be dredged. The computer-aided design software program, InRoads, was used to create the final design lines for construction. InRoads provides greater capabilities to estimate sediment excavation volumes since it can account for side slope shapes and other factors that s. The sediment excavation analysis using InRoads estimated the total sediment volume to be removed, including side slopes at 167,000 yd^3 for Scenario 10 (Table 4). The estimate was based on typical side slopes of 3:1 (horizontal:vertical) from shorelines and assumed offsets from shorelines as shown in the drawings. The addition of a 6-inch overdredge tolerance adds 21,000 yd^3, for a total of 188,000 yd^3 (Table 4).

TABLE 4

Summary of Volume Estimates (CAD Estimates)

Sheboygan River and Inner Harbor AOC Basis of Design Report

Location	Volume with Overdredge Tolerance (yd^3)	Volume without Overdredge Tolerance (yd^3)
Area 1 (Start to 14th Street Bridge)	12,000	9,000
Area 2 (14th Street to Pennsylvania Avenue Bridge)	40,000	32,000
Area 3 (Pennsylvania Avenue to 8th Street Bridge)	136,000	126,000
TOTAL	**188,000**	**167,000**

2.2 Compliance with Applicable Federal, State, and Local Regulations

The final focused FS report for the Lower River and Inner Harbor of the Sheboygan River AOC Site (CH2M HILL 2012) identified the potential federal, state, and local regulations applicable for the remedial action. This BODR describes the laws and regulations that affect implementation of this project and the design features that have been incorporated to address them. To comply with laws and regulations, environmental permits are required for this project. Permit applications have been submitted to the specific agencies, as identified in the permit tracking table in Appendix D. Permit meetings with the applicable stakeholders and permit approvers were held prior to the start of permit preparation, and details and permit approver site-specific interest areas are being captured in the permits. The remedial design addresses known requirements for obtaining permits; additional requirements imposed as part of specific permits will be complied with.

2.2.1 Resource Conservation and Recovery Act

The sediment is excluded from being classified as hazardous under the Resource Conservation and Recovery Act (RCRA) because the remedial action will be performed under a Clean Water Act (CWA) Section 404 Permit. Because the sediment is not hazardous waste, land disposal restrictions under RCRA do not apply and also are not requirements for the sediment expected from this site.

2.2.2 Toxic Substances Control Act

TSCA regulates the remediation and management of soil and sediment contaminated with PCBs under 40 CFR 761. GLNPO and the USEPA Region 5 TSCA Remedial Program are operating under a draft Memorandum of Understanding on TSCA approvals for dredging and disposal of sediment containing PCBs, for projects conducted under GLLA. A Risk-based Disposal Approval application/memorandum for review by the TSCA Remedial Program is being prepared by WDNR. The memorandum presents the risk evaluation to define PCB risk-based concentrations for sediment for the Sheboygan River AOC that are protective of human health and the environment and are consistent with a risk-based cleanup approach as required by the TSCA “Mega Rule” (40 CFR 761.61[c]). The ultimate goal for the risk-based concentrations calculation for sediment is to provide a range of target sediment cleanup levels for the Sheboygan River that will achieve the RAOs of protecting human and ecological health and that will satisfy the TSCA risk-based cleanup requirements.

TSCA requirements for treatment, storage, decontamination and disposal apply to this project. The watertight scow barges, barge mooring facility, offloading apparatus, sediment processing area, and operational procedures will be designed and operated to address the requirements in the regulations, or as accepted under the Risk-based Disposal Approval. For compliance with TSCA disposal regulations, sediment contaminated with PCBs at concentrations of 50 mg/kg or greater will be disposed of at either a hazardous waste landfill permitted under RCRA that is specifically authorized to accept materials with this level of PCBs, or a chemical waste landfill permitted under TSCA as described at 40 CFR 761.75. The volume of sediment that exceeds 50 mg/kg PCBs and will be removed through the GLLA project within the Sheboygan Lower River and Inner Harbor Site is estimated in Table 4. Sediment with an in situ PCB concentration below 50 mg/kg will be disposed of at an approved Subtitle D landfill.

2.2.3 Clean Water Act

CWA requirements and standards will apply to water produced during the sediment processing associated with this project. The CWA provides regulations for the discharge of pollutants into the waters of the United States. It also requires USEPA or the states to set water quality standards for contaminants in surface waters, and that permits be obtained for discharge of pollutants from a point source into waters of the U.S.

A federal program called the Great Lakes Water Quality Initiative began in 1989 to develop uniform water quality criteria for the Great Lakes Basin and resulted in the publication of criteria and methodologies for developing water quality criteria. The criteria were promulgated in the Great Lakes Critical Programs Act of 1990 and are incorporated in 40 CFR Part 132. The remedial design is geared toward achieving the Remedial Action Objectives, Preliminary Removal Levels, and Cleanup Goals, as developed and presented in the FS, to make improvements to the AOC such that BUIs can be lifted.

2.2.3.1 Section 404 Permit

USACE administers dredge and fill activities in waters of the U.S. (including certain wetlands) under Section 404 of the CWA. Discharges associated with mechanized land clearing, ditching, channelization, and other excavation activities that destroy or degrade wetlands or other waters of the United States are regulated under Section 404. No discharge of dredged or fill material will be permitted if it causes or contributes to violations of any applicable state water quality standard or violates any applicable toxic effluent standard or discharge prohibition under CWA Section 307. Section 404 requires a Section 401 water quality certification (see the following subsection) from WDNR, review by the U.S. Fish and Wildlife Service (USFWS) for compliance with the Endangered Species Act (ESA), and the state historic preservation office for compliance with the National Historic Preservation Act (NHPA). USACE regional permits include requirements with which the project will comply. A Joint Permit Application for Section 404, Wisconsin Chapter 30, and Section 10 Rivers and Harbors (see the following subsection) has been submitted

2.2.3.2 WDNR Chapter 30 Permit and Section 401 Water Quality Certification

The WDNR Chapter 30 permit covers removal of materials from the bed of a river or wetlands and the placement of structures (such as fill material, steel sheet pilings, and coffer dams) on the bed of a river or wetlands. The permit complies with Wisconsin State Statutes 281.14, 30.20, and 30.12(1) as well as Section 401 of the Clean Water Act. The Chapter 30 permitting also refers to NR 347 for sediment sampling and analysis, monitoring and disposal criteria for dredging projects, and NR 27, NR29 and State Statute 29.604 for endangered and threatened species. A Joint Permit Application has been filed with both WDNR and USACE. The application describes design details such as water treatment system processes and impervious surface design details, and sets forth measures such as specific best management practices (BMPs) and monitoring frequency and parameters that will be applied during the mechanical dredging operations and periodically reviewed with dredging crews to minimize turbidity and adverse impacts on water quality.

2.2.3.3 WPDES Wastewater Permit

WDNR holds effluent permitting authority in Wisconsin and has set a WPDES monthly average limit for PCBs of 0.8 microgram per liter (µg/L) for the Campmarina Former MGP Site and nondetectable for the PRS Sheboygan River Superfund Site. WPDES permit criteria also have been established for six individual PAH constituents (WPDES Permit No. WI-0062936-01-1). Discharge values similar to these values are expected under a WPDES permit for this project.

The design specifies a temporary water treatment system capable of meeting discharge values that will be established specifically for this remedial action at the Sheboygan River and Inner Harbor AOC Site.

2.2.3.4 WPDES NR 216 Construction Site Stormwater Permit

The WDNR NR 216 permit addresses requirements for construction site storm water runoff under WPDES. The design will specify compliance with these requirements, which typically include development and implementation of soil erosion and sediment control measures, identification of best management practices, and preparation and implementation of a Stormwater Pollution Prevention Plan.

2.2.3.5 WPDES NR 116 Floodplain Management

The WDNR floodplain regulations apply to the site for any change in floodplain water surface elevation. The floodplain management review is incorporated into the WDNR Chapter 30 permitting process. Documentation has been received from WDNR, Sheboygan County, and the City that no floodplain permitting will be required.

2.2.4 River and Harbors Act

Section 10, administered by USACE as part of a CWA Section 404 permit, regulates the creation of obstructions to the capacity of, or excavation or fill within the limits of, the navigable waters of the United States. Typical requirements of dredging permits include measures to minimize resuspension of sediment and erosion of sediment and stream banks during excavation. In Wisconsin, WDNR coordinates obtaining USACE approval as part of the Chapter 30 process. Requirements of the Chapter 30 permit have been incorporated into the design.

2.2.5 Wisconsin Environmental Policy Act

The WDNR NR 150 requirements for environmental review are being met for the dredging activities conducted by this project. The Wisconsin Environmental Policy Act process is underway and is expected to result in an environmental assessment document summarizing the environmental impacts of the project. If necessary, the design will be modified to incorporate measures to reduce environmental impacts.

2.2.6 Fish and Wildlife Coordination Act

Enacted to protect fish and wildlife when actions result in the control or structural modification of a natural stream or body of water. The statute requires that any action taken involve consideration of the effect that water-related projects would have on fish and wildlife, and that preventative actions are made to prevent loss or damage to these resources. Approval from the USFWS has been obtained for use of the Campmarina, WINSA, and Kiwanis Park properties.

2.2.7 Section 106 Cultural Resources Review

The State Historic Preservation Officer (SHPO) reviews procedures for preserving scientific, historical, and archaeological data that might be destroyed through alteration of terrain as a result of a federal construction project or a federally licensed activity or program. A shipwreck near Station 57+00 on the river left side of the river has been identified, and the GLNPOCS contractor will be required to remain 10 feet away in all directions from the shipwreck. In the event additional historical artifacts are encountered during remediation, measures will be taken to protect the finds, and property owners and SHPO will be notified to determine the future course of action.

2.2.8 Endangered Species Act of 1973

Requires federal agencies ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any threatened or endangered species (for example, piping plover) and will not destroy or adversely modify critical habitat. Three listed plant species are potentially present; however, concurrence was received that the project will impose no anticipated adverse impacts.

2.2.8.1 WDNR Natural Heritage Inventory

WDNR requires a review of state-listed threatened, endangered, or species of concern for projects that require a Chapter 30 permit. Information was submitted to the Natural Heritage Inventory Program through the Chapter 30 permit application, and concurrence was received that the project will impose no anticipated adverse impacts.

2.2.9 Other Requirements

2.2.9.1 Notice to Mariners

Once the final dredging schedule is determined, a Notice to Mariners will be issued through the U. S. Coast Guard. The GLNPOCS contractor will coordinate with the U. S. Coast Guard when the dredging contract is awarded.

2.2.9.2 Local Ordinances

Local ordinances address local city and county permitting requirements for heavy equipment operation, construction traffic, noise, operational hours, and other environmental controls during performance of remedial operations. The City of Sheboygan has an erosion control ordinance. The city also has a noise ordinance that restricts construction working hours from 7 a.m. to 11 p.m.; however, a variance has been obtained from the City Council for the GLNPO project. The city also requires a Conditional Use permit if the WINSA property will be used for sediment processing. A Conditional Use permit application was submitted by the GLNPOCS construction contractor on January 24, 2012.

SECTION 3

Design Approach, Assumptions, and Parameters

Section 3 details the dredging design approaches and associated assumptions and parameters as they are envisioned at the prefinal design stage of the project. It should be noted that some elements of the design are conceptual with the intent that details regarding the sediment processing area, site access roadways, and the dredging process will be proposed or modified by the GLNPOCS contractor. A general conceptual description of the mechanical dredging, equipment, utilities, shoreline structures, surveys, and sediment disposal activities expected for this project is included in this BODR. The GLNPOCS contractor will be required to provide a description of their proposed site layout, dredging equipment, and procedures for implementing the work and complying with permit requirements, for approval before starting work. In addition, before starting the work, the GLNPOCS contractor will provide a detailed work plan that will lay out the specifics of the proposed dredging activities. The work plan will be provided to USEPA, USEPA's oversight contractor, WDNR, and other project stakeholders at the direction of USEPA for review.

3.1 Minimizing Environmental and Public Impacts

One of the primary objectives of the dredging operations is to minimize impacts to the environment and public during dredging and sediment processing operations. Minimizing the impacts is achieved through proper permitting and planning during the design phase, as well as adherence to environmental controls and monitoring during the execution of the dredging project.

3.1.1 Execution of Dredging Activities

Project information will be communicated with local property owners, municipalities, and general members of the public before and during the remedial activities to limit the impacts of the project on residents and commercial activities.

During the dredging activities, the resuspension of sediment will be controlled by employing BMPs, which are described in Section 3.9.1. Turbidity will be continuously monitored by the GLNPOCS contractor, and exceedance of criteria will require modifications to the process or equipment as necessary to bring turbidity into compliance with the criteria, as described in Section 4.1.1. In addition to turbidity monitoring, post-dredge sediment confirmation sampling and air monitoring will be conducted as described in Sections 4.1.4 and 4.1.5, respectively.

3.2 Site Preparation and Mobilization

Before mobilization to the site, the GLNPOCS contractor will be required to verify and prove it has obtained or is in compliance with the requirements of the necessary permits. In addition, the GLNPOCS contractor will deliver the necessary preconstruction submittals to USEPA and WDNR for review and approval before mobilization. It is expected that the GLNPOCS contractor will construct the sediment processing areas, sumps, barge mooring facilities, truck loadout areas, and other temporary structures at the Campmarina MGP and the WINSA sites. A general conceptual site layout plan for each site is presented in the design drawings (Appendix E). Historical site information for the WINSA site is located in Appendix F.

Before dredging starts, the GLNPOCS contractor will prepare the sediment processing area to allow heavy equipment to access the portions of the sediment processing and offloading area, and ensure protection of the environment during the dredging-related activities. Land-based activities supporting the mechanical dredging of contaminated sediment will be performed on the sediment processing area. Mobilization and setup of equipment will likely be performed concurrently with sediment processing area preparation activities. The activities will include the following:

- Mobilization of equipment and personnel
- Installation of erosion and sediment control BMPs
- Limited clearing and grubbing of vegetation and implementation of erosion control measures in the areas disturbed by the expansion of the sediment processing area

- Establishment of physical construction limits at the site with temporary fencing
- Setup of a site trailer and utility connections for the GLNPOCS contractor and the USEPA oversight
- Pre-activity soil sampling of the top 2 inches of soil in the planned areas of disturbance and laboratory analysis for PCBs and PAHs
- Construction of a temporary barge mooring, access structures, and drip containment along the shoreline of the sites
- Construction of a sediment processing area, haul roads, water treatment system, and other temporary infrastructure on the Campmarina MGP and WINSA sites
- Installation of turbidity monitoring equipment in the river by the GLNPOCS contractor
- Video and photographic documentation of preconstruction conditions of the existing structures and shorelines
- Notification to U.S. Coast Guard (Notice to Mariners) and local businesses along the river

3.2.1 Preconstruction Sampling

Once the layout of the sediment processing area has been approved by USEPA, WDNR, and the oversight contractor, samples will be collected from this sediment processing area for PCB Aroclor and PAH analysis. The purpose of collecting the samples is to provide documentation of preconstruction conditions for comparison to samples that will be collected after remedial activities have been completed.

Samples will be collected by the GLNPOCS contractor over the footprint of areas to be disturbed during the construction of the sediment processing area, temporary access roads, and other temporary infrastructure. The samples will be collected using a small shovel or other equipment that can be decontaminated between locations. Samples will be collected from the ground surface to a depth of 2 inches.

3.2.2 Sediment Processing Area and Site Access Roadways

3.2.2.1 Campmarina MGP Site

The Campmarina MGP Site will be used as a sediment processing area for the staging of dredging and processing activities for the project north of Pennsylvania Avenue Bridge. The mechanical dredging of wet contaminated sediment requires construction of a sediment processing area that includes an impermeable surface and temporary access roads for offloading, stockpiling, dewatering, and transporting the dredged sediment. The drawings (Appendix E) include an overview of the conceptual plan of the sediment processing area. The sediment processing area will be used to accommodate the reagent/drying agent storage area, temporary onsite water treatment plant, a pug mill mixing facility, decontamination area for trucks hauling stabilized sediment offsite for disposal in appropriate landfill, and dredging debris storage. The portion of the sediment processing area to be used for TSCA sediments is designed for compliance with 40 CFR 761.65(c). Temporary access roads will be built in areas for better access around the site, as part of this construction phase. Temporary access road construction is necessary to provide structural stability and minimize the tracking of loose soil from the sediment processing area onto public roadways by trucks. The following subsections provide a brief description of the activities.

Sediment Processing Area Construction

The Campmarina MGP Site consists of approximately 2 acres for the sediment processing area construction. The work includes construction of a sediment processing area that includes an area with an impermeable surface and a gradual slope, to promote drainage toward two sumps. The sediment processing area layout will be set up to include a 15-foot-wide clearance in between loadout piles as clear lanes or truck roads. TSCA sediments will be offloaded, placed in loadout piles, and stabilized to reduce free liquids separately from non-TSCA sediment. Two sumps will be constructed in the sediment processing area to collect the water from the non-TSCA area and another lined sump will be constructed at the southwestern corner of the TSCA area, to collect the water from the TSCA sediment. The TSCA and non-TSCA areas will be separated by a physical barrier to prevent stormwater from each area comingling. A series of aboveground holding tanks may be used to store additional inflow into the sumps.

Construction of the sediment processing area and sumps includes preparation of the existing surface, installation of a high-density polyethylene (HDPE) geomembrane underneath TSCA areas, placement and compaction of structural fill, placement and compaction of dense-graded aggregate, and installation of an impermeable surface such as asphalt or concrete.

Temporary Access Road Construction

Temporary access roads will be constructed in the Campmarina MGP facility. In areas where there are turns in the roads, they will be constructed to be at least 35 feet wide to allow semi-trucks to turn and maneuver. Once the existing surface is leveled and prepared, a midweight geosynthetic fabric of 6 to 10 ounces per square yard will be laid to separate and stabilize the foundation. Over the geosynthetic fabric, a 6-inch-thick crushed stone aggregate layer will be placed and compacted. The layer of aggregate will meet the requirements of Wisconsin Department of Transportation Series 21 Class AA or Series 22 Class A. The gravel access roadways will minimize the tracking of loose soil onto public roadways. A separate decontamination area will be constructed near the egress of the truck loadout area. The area will be compliant with soil erosion and sediment control standards, and will consist of a mid-weight geosynthetic polymer and a 12-inch-thick aggregate layer. Once the trucks are loaded with sediment for disposal, it will be washed with a power washer to remove sediment adhered to the sides and to the tires. The area will also be used for decontaminating heavy machines and other equipment.

3.2.2.2 WINSA Site

The WINSA Site will also be used as a sediment processing area for the staging of dredging and sediment processing activities for the project. The mechanical dredging of contaminated sediment requires construction of sediment processing area with an impermeable surface and temporary access roads for stockpiling, offloading, and transporting the dredged sediment. The drawings (Appendix E) include an overview of the conceptual plan of the sediment processing area. The sediment processing area will be used to accommodate the reagent/drying agent storage area, temporary onsite water treatment plant, a pug mill mixing facility, decontamination area for trucks hauling stabilized sediment offsite for disposal in appropriate landfill, and dredging debris storage. A new impermeable surface will be constructed over the existing asphalt surface, as necessary, and access routes will be designated in areas where no roadways currently exist for better access around the site. The current ingress and egress points will be enhanced as part of this construction phase. The portion of the sediment processing area to be used for TSCA sediments is designed for compliance with 40 CFR 761.65(c). Temporary access roads construction is necessary to provide structural stability and to minimize the tracking of loose soil from the sediment processing area onto public roadways by trucks. The following subsections provide a brief description of the activities.

Sediment Processing Area Construction

The WINSA Site consists of approximately 1.5 acres for the sediment processing area construction. The work includes removal of existing trees, light poles, and parking islands in the parking lot north of the building and construction of an impermeable surface in the sediment processing area with a gradual slope, to promote drainage toward a sump. The sediment processing area layout will be set up to include a 15-foot-wide clearance between loadout piles as clear lanes or truck roads. The easement to the Alliant property will be maintained to allow Alliant Energy personnel to access their substation. TSCA sediments will be offloaded, placed in loadout piles, stored, and stabilized to reduce free liquids separately from non-TSCA sediment. The TSCA and non-TSCA areas will be separated by a physical barrier to prevent stormwater from each area comingling. A series of aboveground holding tanks may be used to store additional inflow into the sumps.

Construction of the sediment processing area and sumps includes preparation of the existing surface, installation of a HDPE geomembrane under the TSCA area, and installation of an impermeable surface such as asphalt or concrete.

Truck Routes

Truck routes will be designated on the impervious surface and ingress and egress points will be enhanced at the WINSA Site. A separate decontamination area will be constructed near the egress of the truck loadout area. The area will consist of a membrane-lined area to collect wash water. Once the trucks are loaded with sediment for disposal, they will be washed with a power washer to remove sediment adhered to the sides and to the tires. The area will also be used for decontaminating heavy machines and other equipment.

3.3 Shoreline Stability

Mechanical dredging of the contaminated sediment will be performed in the areas as shown in the drawings (Appendix E). The shoreline of Sheboygan River consists of different types of retaining structures and some unimproved natural shoreline slopes. CH2M HILL performed a qualitative shoreline assessment. The shoreline assessment and the photographic logs are presented in the RI report (CH2M HILL 2011a).The Sheboygan River shoreline observed within the project area can be broadly classified into two categories:

- Bulkheads consisting of sheet piling or concrete walls (also called “noncritical structures”)
- Sloped shoreline with concrete blocks and debris, riprap, and timber pilings

Figure 2 presents the different types of shoreline structures observed in the Sheboygan River.

3.3.1 Critical Structures

A structure is deemed critical if a structural failure would endanger safety. On the Sheboygan River, structures such as bridges and buildings in close proximity to the shoreline are considered critical structures. While removal of soft sediment is not expected to impact such structures, differing historical design standards and degradation of the structures and shoreline over time could reduce stability of critical structures. Removal of soft sediment in the vicinity of critical structures will be avoided with an offset. In general, dredging to remove sediment will be started a minimum distance (offset) of 10 feet away from the shoreline followed by a 3:1 slope down to the dredge cut elevation. The 3:1 slope was selected because the shorelines have similar slopes, so providing a dredge surface with that maximum sideslope is not expected to create instability. Larger offset distances have been selected for specific critical structures. Contaminated sediment that is left in place will be addressed through placement of a residuals management layer. Areas where the dredge surface is expected to require a residuals management layer will be sloped at 4:1 (horizontal to vertical) or flatter. The following critical structures have been identified and sediment removal will be performed as described:

- 8th Street Bridge—The two sample points collected immediately upstream of the 8th Street Bridge contained no PCBs or PAHs in one location, and no PCBs above 5 mg/kg until 17 feet below the sediment surface. Dredging will end at the 8th Street Bridge, avoiding dredging near the bridge structure.
- Pennsylvania Avenue Bridge—A 10-foot offset from the piers and abutments will be followed, and the existing sediment surface will be cut back at a maximum 3:1 slope until the maximum target dredge cut depth is reached.
- Railroad Bridge near Station 28+00—Dredging will be done as shown on the design drawings, since the maximum dredge cut is 2 feet.
- 14th Street Bridge—Dredging will be done as shown on the design drawings since the maximum dredge cut is 2 feet.
- Garton Toy Factory Building at Station 26+00 to 40+00—The dredging will start after a 30-foot offset and the existing sediment surface will be cut back at a maximum 3:1 slope until the maximum target dredge depth is reached.
- Boathouse, Rockline Industries, and M & H Outboard & Sterndrive buildings on river right—Dredging will start after a 30-foot offset and the existing sediment surface will be cut back at a maximum 4:1 slope until the maximum target dredge depth is reached.

3.3.2 Noncritical Structures and Unimproved Shoreline

A reasonable attempt will be made to protect noncritical structures from structural failure during dredging activities. A structural analysis of such structures will not be performed, but an offset and slope will be incorporated into the dredging so soft sediment immediately adjacent to noncritical structures is left in place. A 10-foot horizontal offset from the shoreline and a 3:1 horizontal:vertical slope extending downward from the sediment surface at the 10-foot offset are assumed as a buffer zone for dredging near noncritical structures.

3.4 Utilities and Bridges

Information about existing utility lines has been provided in the design documents. The contractor will be responsible for locating and verifying the existence of utilities and for preventing damage. The Wisconsin statewide utility locating one-call number was contacted before the 2010 sediment investigation and again for the 2011 sampling in the Sheboygan River. The information from the utility locate was combined with previously known information to identify several utilities located within the proposed work area. The location of the utilities, their burial depth, and the proposed dredge depth near the utility is shown in Figure 4. Available information indicates the utilities are buried at a depth of at least 7.5 to 8 feet below the proposed dredge depth. As a result of the burial depth, they are not expected to be vulnerable to damage from the dredge bucket. However, insertion of barge spuds into the sediment could cause damage to adjacent utility lines.

Alliant Energy has high-voltage overhead electric lines that cross the river near the 8th Street Bridge, but they are high and are out of reach of equipment that is anticipated to perform the dredging work. The GLNPOCS contractor will confirm the separating distance between the overhead power lines and their equipment, based on their equipment size.

Since no invasive work is planned outside of the river for the dredging of sediment, utilities are not anticipated to pose a conflict with planned dredging activities besides the issue identified previously. However, the GLNPOCS contractor will be required to verify the absence of utility interference before beginning work.

3.5 Surveys

3.5.1 Pre-dredge Survey

Before dredging begins, Affiliated Researchers, a team subcontractor to CH2M HILL under the Great Lakes Architect Engineering Services contract, will perform a pre-dredge bathymetric survey that covers areas the project area. As part of their survey work, they will investigate the wooden piling debris under the Pennsylvania Avenue Bridge.

3.5.2 Post-dredge Bathymetric Surveys

The GLNPOCS contractor will retain a surveying subcontractor to conduct post-dredge bathymetric surveys. Post-dredge bathymetric surveys will be performed several times during the dredging activities to verify target elevations have been reached and to establish payment quantities. Bathymetric surveys will be conducted at the following points during the project (at a minimum):

- After each dredge management unit area is completed
- If a specific section of the river needs to be re-dredged, the area will be surveyed again following re-dredging
- After confirmation sampling indicates each dredge management unit is completed

Additional interim bathymetric surveys will be conducted at least twice per month to document progress. One of the surveys will be conducted the last week of the month to document quantities for monthly progress payments. Bathymetric surveys will be performed as soon as practicable after removing sediment. The surveys will be used to determine if the specified dredge cuts have been achieved as well as providing a final dredged sediment volume for payment.

3.5.3 Debris Survey

A debris survey underneath the Pennsylvania Avenue Bridge will be conducted by Affiliated Researchers, a team subcontractor to CH2M HILL under the Great Lakes Architect Engineering Services contract. The GLNPOCS contractor has the option of performing additional debris surveys in advance of dredging activities.

3.6 Mechanical Dredging

The mechanical dredge method will use an environmental clamshell bucket, with a smooth cut surface and no teeth to dredge the sediment to the specified dredge depths and a conventional clamshell bucket with teeth or closed excavator bucket in areas with a high sand content and debris. The clamshell bucket can either be operated by a crane or cable positioned on the barge. The bucket is controlled by the operator using GPS equipment with

integrated software that allows the bucket's position (horizontal and vertical) to be monitored in real time. Excavated sediment will be loaded into transport barges and moved to one of the two offloading sites.

The performance standards for the mechanical dredging consist of the following:

- Removal of non-TSCA, TSCA, and the PAH-contaminated sediment to specified vertical and horizontal limits
- Removal of additional sediment as needed to create draft clearance for the loaded barges to specified vertical and horizontal limits
- Minimization of sediment resuspension
- Minimization of sediment overdredging

In addition, a recognized environmental dredge system will be used to minimize sediment resuspension. The GLNPOCS contractor must have experience with the equipment and be able to demonstrate their ability to minimize resuspension. Additional mechanisms (for example, bubble curtains or silt curtains) to reduce the potential for recontamination of areas previously dredged will be required and implemented. The dredging is described in detail in the following subsections.

A 6-inch overdredge and/or a 6-inch underdredge tolerance from the neat line are acceptable for the non-TSCA sediment dredging. However, for the TSCA sediment dredging, only a 6-inch overdredge tolerance is acceptable and underdredging is prohibited. The goal with this limitation is to avoid dredge cuts that leave material exceeding the 50 kg/mg TSCA threshold concentration in the river above the dredge cut line. Target dredge elevations will be considered met when the post-dredging bathymetric survey indicates 90 percent of the individual dredge area footprint is at or below the target dredge elevation, and no area is more than 6 inches above the target dredge elevation.

3.6.1 Dredging Equipment

Mechanical dredging of contaminated sediment will be performed with a crane and environmental clamshell bucket having the following capabilities and characteristics:

- Provides a level cut during the closing cycle
- Completely encloses the dredged sediment and water captured
- Has escape valves or vents that close when the bucket is withdrawn from the water
- Has a smooth-cut surface with no teeth. However, for areas of the river with hard river bed, high sand content and where resuspension will not be an issue, a conventional bucket with teeth or excavator can be used
- Is controlled by the operator using GPS equipment with integrated software that allows the following:
  - The bucket position to be monitored in real time
  - The specified horizontal and vertical accuracy requirements to be met
  - The operator to control bucket penetration to avoid overfilling and minimize sediment resuspension

The GLNPOCS contractor will need to closely monitor turbidity during dredging and take the necessary actions to minimize resuspension of sediment.

3.6.2 Dredging Sequence

The GLNPOCS contractor will be responsible for sequencing the dredge operations to meet the needs of their plan for accomplishing the work. For the purpose of developing an engineers estimate of the cost and schedule to complete this project the following dredge sequence has been assumed.

- Dredging activities upstream of 14th Street Bridge (Area 1) will take place concurrently with the downstream dredging activities in Area 2 and Area 3.
- Dredging activities will generally proceed starting from upstream toward downstream.

Dredging in the upstream direction may be required in some areas to allow the dredge and barges to reach the upstream end of the work area, or to accommodate PRS.

To facilitate the movement of dredge equipment under the Pennsylvania Avenue Bridge, the numerous wood piers associated with the old Pennsylvania Avenue Bridge need to be removed. The GLNPOCS contractor will be responsible for the removal and disposal of the wood debris. A hydrographic survey will be conducted in spring 2012 to ascertain additional information on the condition of the debris under the bridge, such as whether the wooden pilings are embedded in sediment or concrete, or loose.

3.6.3 Dredging Process

In general, it is expected the mechanically dredged sediment will be loaded into watertight scow barges and transported to the temporary barge docking platform at the shoreline of the Campmarina MGP Site. The temporary barge mooring area will be constructed with a drip protection system designed to prevent escape of sediment into the river during the barge unloading process. Once the scow barge is docked it will be secured with spuds or anchors to prevent movement relative to shore. Next, the free water on top the dredged sediment in the scow will be pumped out to the temporary water treatment system located in the sediment processing area. Once the free water has been pumped off, the remaining sediment in the scow will be transferred by excavator to the sediment processing area. The sediment will be mixed with a drying reagent and mixing mechanism selected by the GLNPOCS contractor. The drying reagent will be mixed until the sediment meets the requirements of the disposal facility. The GLNPOCS contractor will also conduct paint filter tests during the processing activities and will add reagent when necessary to pass the test. A treatability test to identify a suitable drying reagent will be conducted by the GLNPOCS contractor prior to dredging. For cost estimating purposes, the addition of a drying agent was assumed to be 7 percent.

The stabilized sediment will be directly loaded into the trucks that are staged on the truck loadout area at the northern end of the sediment processing area. Once a truck is loaded, the bed will be covered with a retractable tarp, and the exterior of the truck will be washed with a pressure washer to remove visible sediment and soil. Once truck washing is completed, record keeping will be completed, and the truck will depart the site and transport the sediment to an approved offsite landfill. The conceptual sediment processing area and the sediment offloading system plans are presented in the drawings (Appendix E).

The TSCA sediment will be placed into separate watertight scow barges. Once the TSCA scow barge is docked and secured with spuds or anchors, the free water on top the dredged sediment in the scow will be pumped out to the temporary water treatment system located in the sediment processing area. The remaining sediment in the scow will either (a) follow the same materials handling process as the non-TSCA sediment, in a duplicate but separate process, (b) follow the same materials handling process as the non-TSCA sediment with appropriate decontamination to prevent cross-contamination, or (c) the TSCA sediments may be stabilized in the barge and directly loaded into haul trucks. The contractor will propose a preferred method which will be reviewed for regulatory compliance and approved prior to implementation.

Wash water from the truck decontamination activities will gravity-drain to the sumps in the sediment processing area. Water from rain events will collect in the sumps as well. The sumps will be periodically pumped out directly to the mixing tank in the water treatment system. Suspended solids and adsorbed contaminants in the water will be removed by the water treatment system. The water treatment system is expected to consist of a geotextile tube in a dewatering box equipped with lift gates to facilitate removal of the geotextile tube or some other method of containment, an equalization mix tank, oil/water separator, chemical feed equipment, inclined plate clarifier, sand filtration, and granular-activated carbon (GAC) filtration.

3.6.4 Dredging Production Rate

The sediment is expected to be mechanically dredged and processed for 24 hours per day for 6 days per week. The mechanical dredging rate for removal and disposal of the contaminated sediment must be sufficient to allow the overall project schedule to be met. A total dredge production rate analysis was performed to estimate production capabilities and a dredging schedule and is included in Appendix G.

The analysis was performed for the three separate project areas described previously and indicates if the total maximum production rate varies between 542 yd^3 per day and 1,470 yd^3 per day, the project schedule can be achieved. However, the sediment characteristics and water depth may result in lower production, as will the production rate during dredging of a channel to allow large barges access into the river will be lower.

3.6.5 Debris Handling

3.6.5.1 Non-TSCA Debris

Debris on top of or submerged within the non-TSCA sediment is to be removed and transported to the sediment processing area. The debris will be offloaded onto the sediment processing area and will then be placed in a separate area or rolloff box. Once sufficient debris is collected, or at the end of the sediment dredging work, debris will be transported offsite for disposal at an RCRA Subtitle D landfill. As appropriate, properly decontaminated material with salvage value may be recycled.

3.6.5.2 TSCA Debris

Debris removed from the river in the areas containing TSCA sediment will be offloaded onto the sediment processing area. If possible, sediment will be removed from the debris using a power washer, and placed in a separate area or rolloff box on the sediment processing area. A visual inspection will be performed on the debris to see whether the adhered sediment has been completely removed. Once sufficient debris is collected, or at the end of the dredging work, debris will be transported offsite for disposal at an RCRA Subtitle D landfill. If the TSCA sediment cannot be removed from the debris, it will be treated as TSCA waste and disposed off in a Subtitle C TSCA permitted landfill. As appropriate, material decontaminated in accordance with 40 CFR 761.79 with salvage value may be recycled.

3.6.6 Dredging Positioning System

A system that continuously locates and records the horizontal and vertical position of the cutting face will be required. A real-time kinematic positioning system, or an alternative positioning system that can meet the specified tolerance requirements, will be used to provide the horizontal and vertical positioning for the dredge system. The positioning system will employ software capable of monitoring the *x*, *y*, and *z* position of the dredge bucket in real time. The software will be required to provide the following:

- A real-time view of the barge and clamshell bucket position
- A display indicating the surface derived from the pre-dredge hydrographic survey data
- A display that provides real-time feedback showing current depth, final project depth, target depth, and current bucket depth

The following required tolerances will be met by the GLNPO contractor:

- Horizontal position accuracy will be plus or minus 1 foot
- Vertical tolerance will be plus zero, minus 0.5 foot

3.7 Transport and Disposal

This remedial action requires incorporates transportation of the sediment by licensed waste haulers via trucks equipped with watertight beds to the final disposal locations. A combination of offsite disposal options may be used depending on the contamination level of the sediment. The GLNPOCS contractor will determine the number of trucks needed and the frequency of trips required to match the dredging and sediment processing production rates. Trucks will be restricted by the City of Sheboygan to operating on 10th Street (Water Street) as the primary truck route.

3.7.1 Subtitle D Solid Waste Landfill

Contaminated materials (non-TSCA) from the site will be trucked to an offsite Subtitle D landfill for disposal. Sediment production rates for this project are expected to be high enough that multiple landfills may be necessary to

process the volume of sediment at the rate it will be generated. A summary of potential landfills available to the project is shown in Table 5.

TABLE 5
Offsite Disposal Options
Lower River and Inner Harbor of the Sheboygan River AOC Basis of Design Report

Landfill Owner	Landfill Classification	Location
Waste Management	Subtitle D	Whitelaw, WI
Veolia	Subtitle D	Hilbert, WI
Heritage	TSCA	Roachdale, IN
Clean Harbors	TSCA	Deer Trail, CO or Waynoka, OK

Both Subtitle D landfills have material strength requirements in addition to the sediment passing the paint filter test. The sediment will need to (a) support its own weight, (b) support the weight of material placed over it, and (c) be capable of being worked and managed by the disposal site's low ground-pressure bulldozers. Beyond this general requirement, the Veolia facility has the following additional geotechnical requirements:

- Waste will have either (a) minimum unconfined compressive strength of 0.8 ton per square foot, (b) a minimum cohesive strength of 800 pounds per square foot, (c) a minimum short-term frictional strength of 25 degrees, or (d) defined combinations of cohesive and short-term frictional strength that provide a factor of safety for the landfill slopes as determined through slope stability modeling at least equivalent to (b) or (c). Characterization testing of the dredged sediment will include percent solids/moisture content (American Society for Testing and Materials [ASTM] D2216 or D2974); grain size distribution (ASTM D422); liquid limit, plastic limit, and plasticity index of soils (ASTM D4318); and hydraulic conductivity testing (ASTM D5856 or D2434).
- For compliance with the required landfill's Special Waste Acceptance Plan dredge materials will be field-tested for the following parameters at a minimum frequency of one sample every 1,000 yd^3 for the first 10,000 yd^3 of material and then at a rate of one sample every 5,000 yd^3 thereafter:
  - Percent solids/moisture content (ASTM D2216 or 2974)
  - Unconfined compressive strength (cohesive soils only) (ASTM D2166 pocket penetrometer)
  - Undrained shear strength (ASTM 2573 or D4648)
- Laboratory testing for grain size distribution (ASTM D422) and undrained shear strength (ASTM D2850 or D4767) will also be performed at a minimum frequency of 1 sample every 10,000 yd^3 for the first 30,000 yd^3 and then at a rate of 1 sample every 30,000 yd^3 thereafter.
- Laboratory consolidation tests (ASTM D2435) will be performed at a frequency of 1 sample per 30,000 yd^3.
- In addition, testing of the dredged sediment will be performed for percent solids/moisture content (ASTM D2216 or D2974); grain size distribution (ASTM D422); and liquid limit, plastic limit, and plasticity index of soils (ASTM D4318) at a minimum frequency of one sample every 1,000 tons for the first 5,000 tons of material and then at a rate of one sample every 2,500 tons thereafter. Hydraulic conductivity testing (ASTM D5856 or D2434) of the dredged sediment will be performed at a frequency of one sample every 2,500 tons.

Prior to the start of dredging activities, the GLNPOCS contractor will confirm the specific requirements for receiving sediment with the landfill(s) it selects to use.

3.7.2 TSCA Landfill

Based on prior sampling and analysis, it is estimated that approximately 9,000 yd^3 of the sediment volume targeted for removal would classify as TSCA material being above 50 mg/kg PCB and require disposal at a RCRA landfill

specifically permitted to accept TSCA materials. No such landfills exist in Wisconsin, therefore, transportation and disposal of the dredge material to out-of-state landfills such as those identified in Table 5 is required. The TSCA sediment will meet the strength requirements and quality assurance testing as required by the TSCA permitted landfill. Quality assurance testing will be proposed by the contractor for approval prior to beginning the project. Prior to the start of dredging activities, the GLNPOCS contractor will confirm the specific requirements for receiving sediment with the landfill(s) they select to use.

3.8 Sand Cover

After dredging is complete within an area, post-dredge confirmation sampling will be conducted to determine remaining PCB and PAH concentration levels. Post-dredge analytical results above a (yet-to-be determined) criteria will trigger additional action—namely redredging, and/or redredging placement of a residual sand cover layer. Placement of a cover layer can effectively reduce the residual concentrations to the desired level in areas where sufficient contaminant mass has been removed.

As a result of sediment re-suspension due to dredging activities, residuals are generated, which settle in the immediate dredging area. Residual sediment may contain PCB concentrations greater than the targeted surface concentration of 0.5 mg/kg PCBs. The thickness and locations of the sand cover layer is based on that required to achieve the overall targeted surface weighted average concentration (SWAC) of PCBs in surface sediment upon completion of the dredging activities and cover layer placement. Based on the post-removal SWAC (Appendix H), a 6-inch to 12-inch cover layer of clean sand will be placed over the residual material at select locations to reduce the PCB concentrations to which biota are exposed. It is assumed that a 6-inch to 12-inch sand cover layer placed over the section exceeding the criteria will result in a clean surface with surface concentration less than 0.1 mg/kg PCBs. Based on theoretical calculations that represent a worst-case scenario, the 6-inch to 12-inch sand cover would be placed along the river right descending bank of the federal navigational channel. Appendix H presents the sand cover thickness calculations and the locations of the sand cover placement along the federal navigational channel. The overall SWAC for the project area before and after dredging and cover layer placement was calculated using the Theissen polygon method. The resulting post-removal SWAC with sand cover is 0.5 mg/kg compared to the post-removal SWAC without sand cover of 3.0 mg/kg PCBs. The post-removal SWAC calculations are included in Appendix H.

3.9 Water Quality

3.9.1 River Water Quality

The potential to create turbidity and impact river water quality will be minimized by the GLNPOCS contractor's adherence to BMPs specific for each dredging practice. The following BMPs will be applied during the mechanical dredging operations and periodically reviewed with dredging crews:

- Barges will be watertight and inspected to confirm water tightness prior to dredging operations and dredged material transport.
- An environmental clamshell bucket will be used for mechanical dredging of contaminated sediment. However, for areas with hard bottom, high sand content, debris, and where resuspension will not be an issue, a conventional bucket with teeth or excavator bucket can be used.
- Work on slopes will proceed from top of slope to toe of slope.
- The GLNPOCS contractor will use positioning devices (such as a system GPS) on the dredge bucket to allow the operator to be aware of the location of the dredge bucket in relation to the top of the sediment and the post-dredge design surface.
- The GLNPOCS contractor will use an experienced environmental dredging operator capable of implementing appropriate BMPs to limit resuspension.
- The operator will minimize overfilling of the dredge bucket.

- The operator will reduce the rate of bucket descent and retrieval as necessary.
- The operator will perform single bites with the bucket, and each bucket will be brought to the surface and emptied between bites.
- The operator will slowly release at the surface the water that drains from the valves in the environmental bucket.
- The operator will not overfill barges with dredged material.
- Oil booms will be available for emergency use.

The GLNPOCS contractor will be required to meet the project-specific turbidity criteria as part of its work. The use of equipment or means and methods beyond the BMPs will not be specified unless required by permit. An air bubble curtain will be constructed at the downstream edge of each of the project areas and would be operated continuously during any dredging activities in the river to avoid releases of suspended solids into the area downstream of the work site. The air bubble curtain will not be turned on until clearance has been given by the WDNR that the spring fish run is over. Silt curtains will be employed as temporary measures as applicable if dredging occurs before the spring fish run is complete. Also, silt curtains may be used for the mechanical dredging of TSCA sediment and whenever turbidity exceedances are reported. Additionally, the GLNPOCS contractor will be required to consult with USACE, the local businesses, recreational users, other commercial freight companies using the channel, and others as necessary to ensure the placement of silt curtains does not interfere with commercial vessels.

The success of the GLNPOCS contractor's efforts to control turbidity will be evaluated through river water monitoring activities as described in Section 4.1. If a turbidity exceedance is noted by the USEPA's oversight contractor, the GLNPOCS contractor will be consulted and the source of the turbidity will be evaluated. If dredging activities are the suspected cause of the excessive turbidity, the dredging process or equipment will be modified so the turbidity criterion is met. Implementation of engineering controls will be considered as part of the dredging work if compliance with the turbidity criteria cannot be achieved through the BMPs. Implementation of engineering controls will be approved by USEPA, WDNR, and USEPA's oversight contractor.

3.9.2 Wastewater from Construction Activities

Wastewater generated from the sediment processing areas at Campmarina and WINSA will be treated separately with water treatment plants located at each area. The two water treatment plants will be sized differently based on the anticipated sediment processing rates and stormwater runoff volumes. Included in Appendix G are the calculations and assumptions for the water treatment systems flow rates and storage volumes from various wastewater sources to each of the treatment plant. The calculations are used to develop the design flow rate for the water treatment plants.

3.9.2.1 Wastewater Sources, Volume and Flow Rates

During the sediment removal, processing and disposal construction activities, the sources of wastewater to the water treatment plants are anticipated to include the following:

- Free water on top of the sediment that is pumped out of the scow
- Gravity-drained water from the dredged sediment loadout piles in the sediment processing area
- Decontamination wash water
- Precipitation on the sediment processing area
- Backwash water from the water treatment plants

The volume and flow rates for each source of wastewater was estimated and combined to determine the water treatment plant capacity. Each water treatment plant will include redundant treatment train(s) to allow the plants to operate at capacity during routine maintenance and during process upsets that may occur during the project.

Free Water Removed from Sediment

Campmarina Water Treatment Plant. It is anticipated that 60 percent of the total dredged sediment volume will be handled at the Campmarina Site. Assuming that 25 percent of the water in the dredged sediment can be recovered as free water in the scow, the total wastewater volume generated during the project by pumping the free water is

estimated to be 6.1 million gallons. Averaged over an estimated 78-day construction duration, an average flow rate of 55 gpm is possible to the Campmarina water treatment plant.

WINSA Water Treatment Plant. It is anticipated that 40 percent of the total dredged sediment volume will be handled at the WINSA Site. Assuming that 25 percent of the water in the dredged sediment can be recovered as free water in the scow, the total wastewater volume generated during the project by pumping the free water is estimated to be 4.0 million gallons. Averaged over an estimated 52-day construction duration, an average flow rate of 55 gpm is possible to the WINSA water treatment plant.

Gravity-drained Water from the Dredged Sediment Loadout Piles

It is expected that during the handling and stockpiling of dredged sediment, interstitial water from the sediment will be gravity drained and collected in the sumps. A portion of the interstitial water will be lost through evaporation and with the likely addition of a drying agent. It is assumed that a volume equivalent to 10 percent by mass of the total mass of water present in the dredged sediment will be gravity drained and will require treatment. This yields a total volume of 2.4 million gallons of gravity-drained water that will be treated by the Campmarina treatment plant and a total volume of 1.6 million gallons of gravity drained water that will be treated by the WINSA treatment plant. This equates to an average flow rate of 22 gpm at each treatment plant.

Decontamination Water

A 4-gpm pressure washer is assumed to be used for decontaminating trucks, debris, and equipment. This flow rate is anticipated for both the Campmarina and WINSA water treatment plants.

Precipitation on the Sediment Processing Areas

The WPDES stormwater program requires a 10-year 24-hour rainfall event to be used to size the treatment plants for each sediment processing area. The precipitation depth for a 10-year 24-hour storm event for the Sheboygan county area is 3.56 inches (Huff et al. 1992).

In addition to the WPDES stormwater program, a 25-year 24-hour storm event over the TSCA material processing area is required to be considered (40 CFR 761.61 and 40 CFR 761.65). These regulations implement TSCA requirements for a liners, covers, run-on control, and collection and treatment of water. The precipitation depth for a 25-year 24-hour storm event for the Sheboygan county area is 4.46 inches (Huff et al. 1992).

While it will be unlikely that dredging and sediment processing activities will be occurring during these large precipitation events, the water treatment plants will be sized to receive the estimated stormwater flow rates during the entire project.

Campmarina Water Treatment Plant. The 84,536-square-foot sediment processing area for non-TSCA sediment yields a total stormwater volume of 187,591 gallons for a 10-year 24-hour event. Treating the volume of stormwater over a 24-hour period equates to an average flowrate of 130 gallons per minute (gpm). The non-TSCA sediment processing area will provide storage of at least the stormwater volume (separately from the TSCA material) to allow the stormwater to be treated over a 24-hour period.

For the Campmarina TSCA processing area of 4,563 square feet, a 25-year 24-hour storm event yields an additional stormwater volume of 12,685 gallons, which yields an average flow rate of 9 gpm over a 24-hour period. The TSCA sediment processing area will provide storage of at least the stormwater volume (separately from the non-TSCA material) to allow the stormwater to be treated over a 24-hour period.

A 139-gpm (130+9) treatment capacity will be provided for stormwater flows from the Campmarina processing areas.

WINSA Water Treatment Plant. The 54,450-square-foot sediment processing area for non-TSCA sediment yields a total stormwater volume of 120,828 gallons for a 10-year 24-hour event. Treating the volume of stormwater over a 24-hour period equates to an average flowrate of 84 gpm. The non-TSCA sediment processing area will provide storage of at least the stormwater volume (separately from the TSCA material) to allow the stormwater to be treated over a 24-hour period.

For the WINSA TSCA processing area of 3,500 square feet, a 25-year 24-hour storm event yields an additional stormwater volume of 9,730 gallons, which yields an average flow rate of 7 gpm over a 24-hour period. The TSCA

sediment processing area will provide storage of at least the stormwater volume (separately from the non-TSCA material) to allow the stormwater to be treated over a 24-hour period.

A 91-gpm (84+7) treatment capacity will be provided for stormwater flows from the WINSA processing areas.

Backwash water from the Onsite Water Treatment System

The volume of backwash water from the onsite water treatment systems will vary based on the operation of the system. Depending upon the dredging rates and the treatment system influent quality, each water treatment plant will likely be backwashed once per day. Each backwash is estimated to produce 2,400 gallons of water over 60 minutes, which equates to 40 gpm for each water treatment plant.

Total Wastewater Flow Rates

Appendix G includes the calculations and assumptions for each of the water treatment plants flow rates and volumes. Table 6 is a summary of the total wastewater flow rates that each water treatment plant will be sized to treat over a 24-hour period. The water treatment plant capacity is the sum total of each wastewater source. It is unlikely that all of these sources will contribute to the water treatment plant at the same time; however, summing the individual sources will help minimize the potential for the treatment plant capacity to be exceeded.

TABLE 6
Water Treatment Plant Capacity Summary
Lower River and Inner Harbor of the Sheboygan River AOC Basis of Design Report

Treatment System	Campmarina Water Treatment Plant Design Flow Rate (gpm)	WINSA Water Treatment Plant Design Flow Rate (gpm)
Estimated Typical Daily Flow Rates		
Free Water from Sediment	55	55
Gravity-Drained Water from the Dredged Sediment Loadout Piles	22	22
Decontamination Water	4	4
Backwash Water from the Onsite Water Treatment System	40	40
Total Estimated Typical Daily Flow Rate	121	121
Estimated Peak Stormwater Flow Rates		
Precipitation on the Sediment Processing Areas	139	91
Total Estimated Flow Rate	260	212
Design Flow Rate	**275**	**225**

3.9.3 Water Treatment

The conceptual design for the temporary onsite water treatment system is expected to consist of a geotextile tube in a dewatering box, an equalization mix tank, oil/water separator, chemical feed equipment, inclined plate clarifier, sand filtration, and GAC filtration. The conceptual design is provided as a minimum acceptable configuration, but the GLNPOCS contractor can propose an alternative water treatment system design for review. Treated water will be discharged back to the Sheboygan River upstream of the bubble curtain at the 8th Street bridge. The GLNPOCS contractor will be required to meet the performance standards as defined by the pretreatment requirements in the WPDES permit once it is received. The permit will be made available as part of the bid documents. The anticipated monitoring requirements and effluent limitations based on the Sheboygan Superfund Site permit are presented in Table 7.

TABLE 7
Water Treatment System Anticipated Effluent Quality Monitoring Requirements
Lower River and Inner Harbor of the Sheboygan River AOC Basis of Design Report

Parameter	Limit Type	Limit/Units	Sampling Frequency	Sample Type
Flow		million gallons per day	Daily	Continuous
BOD	Monthly Average	10 mg/L	1/2 weeks	24-Hr Comp
TSS	Daily Maximum	10 mg/L	Daily	24-Hr Comp
TSS	Monthly Average	5 mg/L	Daily	24-Hr Comp
Oil and Grease	Monthly average	15 mg/L	Daily	24-Hr Comp
PCB Total	Daily Maximum	Nondetect	Daily	24-Hr Comp
PAH Total[a]	Monthly Average	0.1 mg/L	Daily	3 grab Comp

[a] The PAH group regulated by this permit is expected to include a summation of the following individual compounds: benzo(a)anthracene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene. Compliance with the monthly average PAH group limit can be demonstrated by using USEPA method 610 or 8310 HPLC and reporting no detect of any of these PAH compounds, or by reporting the sum of the PAH group detected amounts equal to or less than 0.1 milligram per liter (Source: Personal Communication with Heather Williams/USEPA. October 11)

mg/L = milligrams per liter

The treatment system will be setup on a portion of the project area. Wastewater sources will be pumped through a geotextile tube installed in a dewatering box to remove gross amounts of total suspended solids before flowing into an equalization mixing tank, followed by an oil/water separator, where any free phase oil will be collected separately for appropriate disposal. The underflow water from the oil/water separator will be chemically conditioned, and then pumped into an inclined plate clarifier. The effluent from the clarifier will be pumped to sand filters, then into intermediate bag filters, followed by series of GAC filters. The equalization mixing tank will have a 21,000-gallon capacity. The supernatant from the oil/water separator will be disposed of as oil waste according to state and federal permit requirements.

The GAC vessels will be selected based on hydraulic capacity and will be operated in a lead-lag mode (series flow). The lead vessel will be monitored for breakthrough of PCBs and/or PAHs. GAC and sand filter backwash wastewater will be sent back to the mixing tank. Initially, the GAC effluent will be stored in holding tanks prior to discharge. Once a tank is full, it will be sampled for PCBs, PAHs, total suspended solids, and biochemical oxygen demand, and the flow will be directed to a second empty holding tank. An initial test batch of water will be held until analytical results are received. Once analytical results indicate the water in the full holding tank meets the discharge criteria, the water will be discharged back into the Sheboygan River. If the analytical results indicate the water in the full holding tank does not meet PCB criteria, it will be recirculated through the treatment system.

After the initial testing indicates the treatment system is capable of treating the water satisfactorily, the water will not be held and discharged in a batch manner. Treated water will be sampled daily in accordance with the discharge permit requirements.

A portion of the effluent from the GAC vessels may be stored as a non-potable water source for treatment plant use and backwash cycles. Potable water will be used as a backup water supply.

The treatment system controls and monitoring devices, at a minimum, will include the following:

- Flow meters to indicate influent flow to the treatment system, key unit processes, and final effluent
- Turbidity meters to monitor water quality of effluent from the GAC filters
- Variable speed pumps to regulate the flow rate through the treatment system
- Pressure gauges to monitor head loss across the GAC, bag filters, and sand filters
- Flow meter measuring total volume of effluent discharged
- Sampling ports to enable collection of samples of system influent and effluent

Consideration could be given to providing additional influent equalization capacity, which would enable shutdown of the treatment system for significant periods to remedy operational issues.

SECTION 4

Performance Monitoring and Operation and Maintenance Requirements

Sections 4 summarizes the performance monitoring and operations and maintenance requirements for the dredging activities. Additional details regarding sample collection, sampling methods, and data management will be developed in the quality assurance project plan and field sampling plan.

4.1 Water Quality Monitoring

4.1.1 River Water Quality Monitoring

The effectiveness of the GLNPOCS contractor in performing the dredging activities while using the BMPs provided in Section 3 to minimize the associated water quality impacts will be determined through monitoring of the turbidity in the river, at locations and frequencies that will be specified in the WPDES Chapter 30 permit. An air bubble curtain will be constructed at the downstream edge of the project area and will be operating continuously during dredging activities in the river to avoid releases of suspended solids downstream. The air bubble curtain will not be turned on until clearance has been given by WDNR that the spring fish run is over. Silt curtains will be employed as temporary measures as applicable if dredging occurs before the spring fish run is complete. Also, silt curtains may be used for the mechanical dredging of TSCA sediment and whenever turbidity exceedances are reported and cannot be mitigated by BMPs. Within the river, turbidity monitoring will be conducted during dredging to monitor total suspended solids. At the start of the project, a correlation will be developed between total suspended solids as analyzed by laboratory and nephelometric turbidity units (NTUs) as measured in real time by instruments. If turbidity readings indicate suspended particles are approaching criteria levels the contractor will be required to implement mitigating actions. Expected criteria levels include 35 NTUs above background to cause the contractor to take action, and 70 NTUs above background to cause the contractor to stop work, based on existing 2011 dredging projects. Additionally, oil booms will be kept on board the dredging plant as a contingency measure when dredging is being implemented in areas with known PAH contamination. Oil booms are to be deployed immediately with any sign of oil sheens.

The GLNPOCS contractor will monitor water turbidity in the Sheboygan River to evaluate compliance with the turbidity control standards as required by the permit. Turbidity will be measured by in-stream, real-time monitoring automated turbidity meters generating readings at regular intervals (once every 10 minutes). Due to relatively shallow water at the turbidity monitoring locations, one turbidity sensor will be deployed at each location at mid-depth of the river. The sensors will be installed on small floating platforms to simplify relocation when necessary. Turbidity readings will be transferred by cellular modem telemetry, compiled, and made available on a password-protected Web site within 5 minutes of each reading. Data from the turbidity sensors will also be stored in an integrated data logger that can be accessed in the event the telemetry system is inoperable. Depending on the wind direction and the seiche effects of Lake Michigan, water flow in a portion of the river may change direction, flowing to the west/north versus seasonal river flow. However, the change in flow should not change the definition of upstream and downstream of the river.

Six turbidity monitoring stations will be placed in the river during the dredging operations, and a set of two monitors will be used at each dredging area. In each of the dredging areas, one monitoring station will act as the upstream station and one will act as a downstream station. The turbidity monitoring station locations will be shown on the design drawings.

As stated previously, readings will be recorded once every 10 minutes at the six turbidity monitoring stations. A rolling average of 6 consecutive readings (1 hour) at each location will be used as the basis of comparison. The rolling average value of the upstream (background) location will be compared to the rolling average value of the downstream location. If an obvious outlier appears, it will be eliminated from the rolling average calculation. An outlier will be defined as a reading that is outside the range of 50 to 200 percent of the average of the three previous readings. In addition, to be considered an outlier, the following reading must return to a range of 75 to 133 percent

of the average of the3 readings preceding the outlier. In practice, it is common to get occasional one-time spikes that cannot be tied to activities in the water. If this happens regularly (that is, more frequently than twice per day), the sensor will be inspected and cleaned, repaired, or replaced.

The turbidity monitoring setup will be equipped with the means of sending out an automated e-mail notification to the USEPA oversight contractor's field personnel based on readings. A reading from any of the sensors exceeding 35 NTUs will be used as the basis for sending out an e-mail notification. The onsite construction manager for the USEPA oversight contractor will be responsible for performing the calculations necessary to determine if a turbidity exceedance has occurred once the automatic e-mail notification has been received. All turbidity and water quality monitoring and sampling collected by the GLNPOCS contractor will be provided to USEPA throughout and after the project. In the event of an exceedance, appropriate measures will be taken to remedy the cause of the exceedance, and notifications will be made in accordance with permit requirements and federal and state regulations.

4.1.2 Water Treatment System Monitoring

The initial effluent water from the water treatment system will be held until analytical testing indicates the water has met the discharge permit criteria before being discharged in batch mode. Subsequent discharges will be on a continuous basis during the mechanical dredging activities, and will be sampled and tested for PCBs, PAHs, biochemical oxygen demand, total suspended solids, and turbidity or as otherwise specified in the WPDES permit. In addition to the above parameters, the discharge flow rate and volume will also be monitored. Turbidity readings will be obtained using a direct reading instrument. The water treatment system monitoring criteria and effluent standards are presented in Table 6 in Section 3. Additional parameters might be required to be monitored or tested by the WPDES permit, such as pH, temperature, and flow rate.

Samples of effluent collected from holding tanks will be submitted to an offsite laboratory for the criteria, and rapid turnaround of preliminary results will be requested.

4.1.3 Stormwater Monitoring Requirements

Stormwater discharge from the project area will be regulated under a WPDES construction stormwater permit as well as local stormwater regulations. The WPDES Stormwater Program regulates discharge of stormwater in Wisconsin from construction sites, industrial facilities, and selected municipalities. Stormwater that falls on the sediment processing areas during the remedial activities will be collected through the sumps on the sediment processing areas, and treated, and discharged under the water treatment system's WPDES permit. The anticipated discharge criteria are presented in Table 6.

Erosion control measures will be implemented prior to the start of site remediation activities. The controls will include, but are not limited to, silt fence, filter fabric for sewer inlet protection, and construction entrances and exits. Silt fence or other protection measures will be installed around the sediment processing areas and temporary staging and decontamination areas. Stormwater and erosion control plans prepared under the WPDES stormwater discharge permit will also be submitted to the City of Sheboygan.

4.1.4 Sediment Confirmation Sampling

After dredging in each of the dredge areas is completed to the design cut lines (or to native clay if encountered before the cut lines), a post-dredging bathymetric survey will be performed by the GLNPOCS contractor to document the dredging cut lines have been achieved and for the purposes of invoicing and payment. After completion of the dredging, confirmation sampling will be performed over the footprint of the areas to document the residual PCB and PAH contamination remaining.

4.1.5 Air Monitoring

Activities that can cause particulate emissions include sediment stabilization and mixing with drying agent. Although airborne particulates associated with stabilization and dewatering techniques are not likely to be generated, some airborne particulates may be created if sediments dry before disposal or from the drying agents themselves. Therefore, best available dust suppression practices, such as spraying with clean water and covering sediment and

soil loadout piles, will be used, as necessary, to control potential particulate emissions. A plan to mitigate dust during the remedial action will be included as part of the site management plan and health and safety plan.

Air monitoring for particulate matter will be performed by the GLNPOCS contractor during the mixing of sediment with the stabilization/drying agent, because of the possibility of dust being released during sediment handling and stabilization. Real-time monitors that measure particulate matter finer than 10 micrometers in diameter and smaller (PM_{10}) will be used for monitoring. Every morning, the data from the previous day will be used to determine if the PM_{10} primary National Ambient Air Quality Standard of 150 micrograms per cubic meter over a 24-hour period is being exceeded. If the PM_{10} standard is being exceeded, and the sediment stabilization operations are suspected as the source of the PM_{10} emissions, the sediment stabilization operations will be evaluated and modified to reduce fugitive dust emissions. The locations of the air monitoring stations will be evaluated in the next phase of design.

4.1.6 Odor Control

If an odor nuisance to onsite personnel or to the surrounding community occurs, appropriate odor control measures will be implemented. Odor control measures will be implemented if one or more legitimate complaints are made to the City or onsite personnel. The City of Sheboygan in consultation with USEPA will determine if an odor complaint is legitimate. The odor control measures may include usage of foaming agents such as Russmar Foam technology, over the loadout piles of dredged sediment in the dewatering area or usage of a proprietary Ecosorb technology by OMI Industries. Also, general BMPs will be implemented to avoid any fugitive odors.

SECTION 5

Project Delivery Strategy

Section 5 presents the project delivery strategy for the design and remediation of the Sheboygan River and Inner Harbor AOC Site. The primary components of the design and remediation, as discussed in the preceding sections, are summarized in the following subsections. Key project delivery strategies relative to a specific component are noted within each subsection.

5.1 Remedial Design

To streamline its development, preparation, and delivery, the remedial design will be accomplished in two phases: (1) preparation and submittal of the preliminary design, and (2) preparation and submittal of the prefinal/final design.

5.1.1 Preliminary Design

The primary objective of the preliminary design was to define in detail the technical parameters upon which the design will be based. It was also the intent of the preliminary design to develop the conceptual strategies and ideas that compose the framework of the remediation project, review the strategies and ideas with the stakeholders, and finalize the strategies and ideas so the prefinal/final design may proceed with minimal changes (for example, minimal cost and schedule impacts).

5.1.2 Prefinal/Final Design

Once the conceptual strategies and ideas and supporting technical details were developed, reviewed, and finalized, the prefinal/final design activities began. The conceptual strategies and ideas developed and presented in the preliminary design document have been expanded into a set of design documents consisting of the following:

- BODR
- Specifications
- Drawings
- Cost estimate
- Site-specific plans
- Biddability, operability, and constructability reviews
- Revised project delivery strategy
- Construction quality assurance plan

Detailed design drawings and specifications have been prepared. Some of the design specifications for the project will be performance-based (that is, a specific design is not provided to the subcontractor). This type of contract allows the subcontractor the flexibility to provide innovative and cost-effective solutions for the project. The selected subcontractor will be required to present a detailed remedial action work plan describing how the work will be executed.

5.2 Remedial Action Delivery Strategy

Site work activities including but not limited to dredging, dewatering, water treatment, offsite disposal, and site restoration will be conducted under a single USEPA contract with one of its GLNPOCS construction contractors. The GLNPOCS contractor will also procure a laboratory for analyzing samples associated with turbidity monitoring, the wastewater treatment plant, air quality, waste profile characterization and ongoing waste disposal, and upland sediment processing areas restoration.

CH2M HILL will procure the laboratory to analyze the sediment confirmation samples.

CH2M HILL will support the remedial action by assisting USEPA with the following, if requested:

- Prebid Activities
- Printing and distribution of contract documents
- Resolving inquiries/issuing addenda

The contract documents will be prepared based on the understanding that USEPA is the owner of the project and CH2M HILL is the engineer. CH2M HILL will prepare the project specifications and drawings.

SECTION 6

Schedule

A prefinal construction schedule for the remedy is provided in Appendix I. The schedule is based on calendar days and allows for weather days and a delay in using the sediment processing area at the WINSA Site while PRS completes its dredging in front of the property first. It is assumed that PRS will have finished dredging in front of the WINSA Site by May 4, 2012, per the schedule prepared December 6, 2011.

SECTION 7

Specifications Outline

The prefinal design specifications are located in Appendix E.

SECTION 8

Prefinal Design Drawings

The prefinal design drawings are located in Appendix E.

SECTION 9

Prefinal Cost Estimate

A prefinal cost estimate has been prepared and will be submitted as a separate memorandum.

The information in the cost estimate is based on the project information described in the BODR. Changes in the cost elements are likely to occur as a result of refinement of the remedial action during the prefinal design of the remedial alternative. The prefinal cost estimate is an order-of-magnitude cost estimate that is expected to be within +20 to -15 percent (CH2M HILL Class II estimate) of the actual project costs.

The cost estimates shown, along with resulting conclusions on project financial or economic feasibility or funding requirements, have been prepared for guidance in project evaluation and implementation from the information available at the time that the cost estimate was prepared. The final costs of the project will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, and other variable factors. As a result, the final project costs will vary from the cost estimates presented herein. Because of these factors, project funding needs must be carefully reviewed before specific financial decisions are made or project budgets are established to help ensure project evaluation and adequate funding.

SECTION 10

References

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Figures

Appendix A
PRS Depth of Water Figures

Appendix B
Sediment Modeling

Appendix C
Remedial Design Sediment Sampling Event Technical Memorandum

Appendix D
Sheboygan River Permit Tracking Sheet

Appendix E
Prefinal Design Drawings and Specifications

Appendix F
Historical WINSA Site Information

Appendix G
Process Calculations

Appendix H
SWAC and Residuals Management

Appendix I
Remedial Action Schedule